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## INDEX TO ADVERTISEMENTS.

(THOSE WITHOUT NUMBER OF PAGE DO NOT APPEAR IN THIS ISSUE.)

	PAGE.		PAGE.		PAGE.
Aird, J.	529	Fraser and Chalmers (Ltd.)	529	Pass and Son	552
Ashbury Railway Carriage and Iron Co. (Ltd.)	529	Frictionless Engine Packing Company	529	Phosphor Bronze Co. (Ltd.)	552
Austin, J. B.	529	Galloway's (Ltd.)	529	Piggott and Co.	552
Bandell, H. B.	529	Gates Iron Works Co.	529	Publications	552
Bank of Africa, (Ltd.)	551	Gilkes and Co.	529	Robey and Co.	555
Banking	529	Greening and Sons (Ltd.)	529	Roburite Explosives Co. (Ltd.)	555
Barker and Co.	529	Green, G.	529	Ropeways Syndicate	555
Bennett, Sons, and Co.	529	Green, J. G.	529	Rose, James	552
Bowen-Scott and Western	529	Halse, E.	529	Sales by Auction	551
Burwell and Co.	542	Harvey and Co. (Ltd.)	529	Schram and Co.	551
Bute Works Supply Company (Limited)	552	Hett, O. L.	529	Seward, William	551
Business Cards	529	Holman Bros.	529	Shipping	551
Calvert, Albert B.	529	Howes, S.	529	Smith, Chas.	551
Cannock Chase Colliery Company	529	Humboldt Engineering Works Co.	529	South African Trust and Finance Co. (Ltd.)	551
Cassell Gold Extracting Co. (Ltd.)	553	Huntington, Professor	529	Spencer, John	551
Champion Rock Borer Co.	531	Ingersoll-Sergeant Drill Co. of America	529	Stanley, W. P.	551
Charleston, A. G.	533	Ireland, James	529	Stewart and Clydesdale	551
Clarkson, T.	533	Jones, J. A.	529	Symons, Brenton	551
Clarkson-Standfield Concentrator (Ltd.)	539	Jose, Ford and Co.	529	Tacknott	551
Commercial Stock and Share Corporation	551	Kitto, B.	529	Tangyres Limited	551
Companies and Legal Announcements	529	Krupp Grusonwerk	529	To Let	551
Cornforth and Co.	558	Larmuth, T. and Co.	529	Tuck and Co. (Ltd.)	559
Cotton Powder Co. (Ltd.)	529	Lancashire Patent Belting Co.	529	United Asbestos Co. (Ltd.)	553
Davey, Paxman and Co.	529	Lancaster and Tonge	529	Unity Safety Fuse Co.	553
Davies, Henry	533	Lewis and Sons	529	Vivian's Boring Co. (Ltd.)	529
Davis and Son	534	Lloyd and Lloyd	529	Walker Brothers	529
Daw, A. and Z.	529	Maclean, J. Grant	529	Walters, W. M., and Co.	551
Daw, A. and Z.	529	Marsden, H. R.	529	Wanted	551
Delta Metal Co. (Ltd.)	529	Martin and Pethybridge	529	Watson, P. and Co.	529
Dixon and Co.	529	Merry and Co.	529	Wellington and Co.	529
Duncan and Co.	553	Merton and Co.	529	Whitehead, J. H.	529
E'liman, Sons, and Co.	551	Nobel's Explosives Co. (Ltd.)	529	White, William	529
Entertainments	529	Osborn and Co.	529	Wiggin and Co. (Ltd.)	542
Felten and Guilleaume	553	Pacific Mining Agency and Trust Company	529	Wood, Charles	529
For Sale	551	Parkin	529		
Francis and Jenkins	529				
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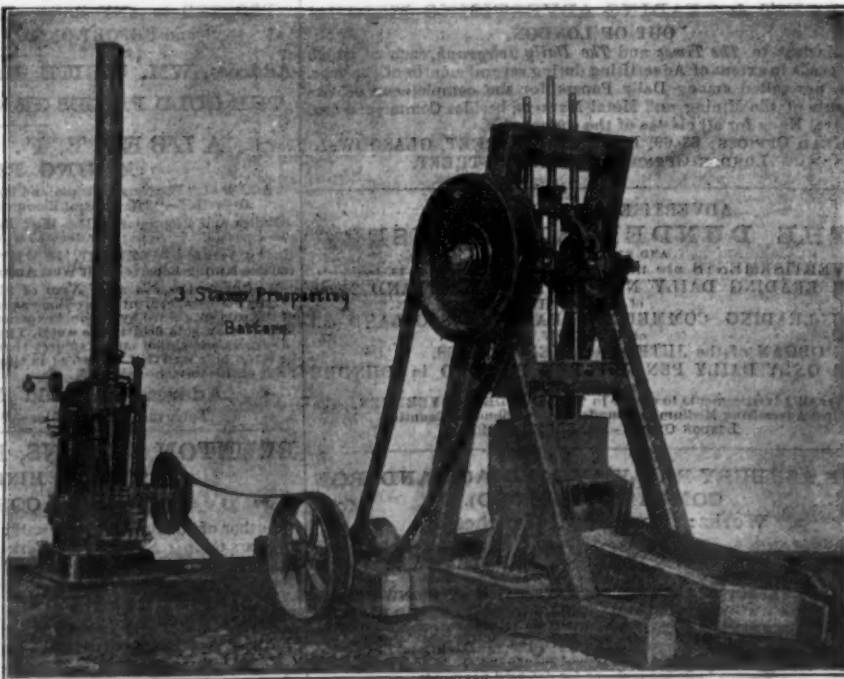
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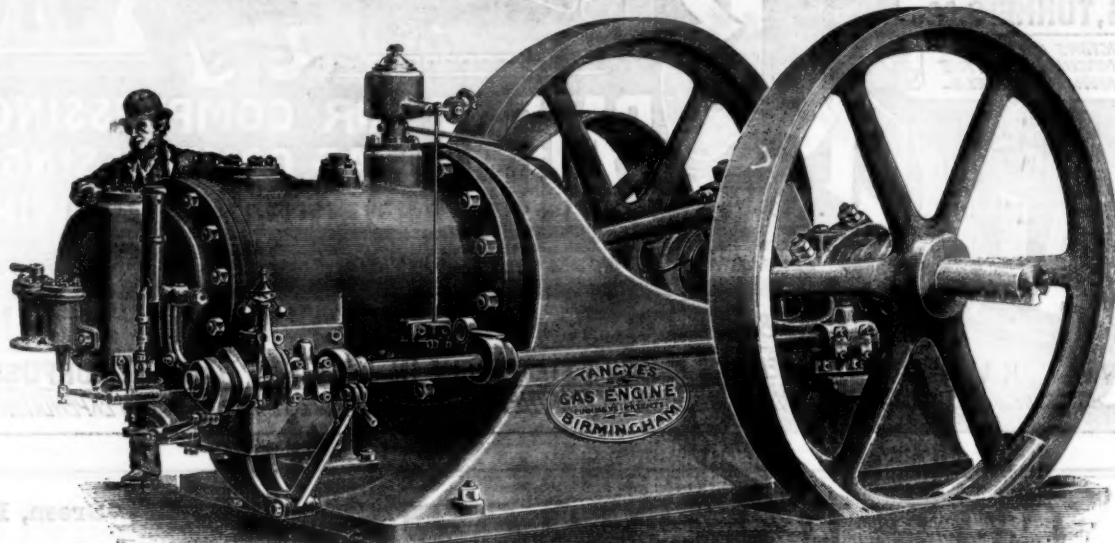
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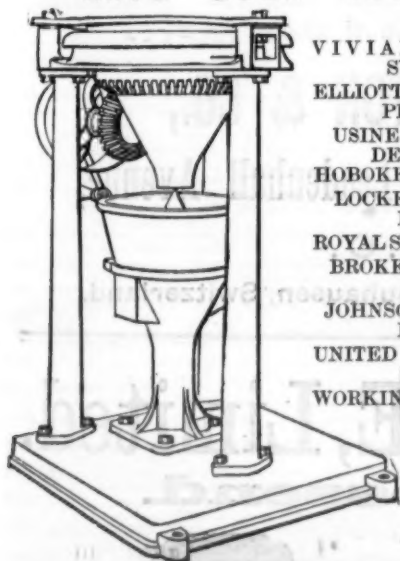
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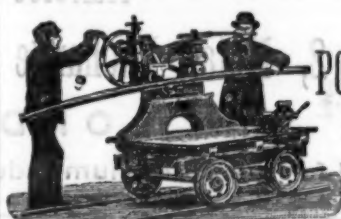
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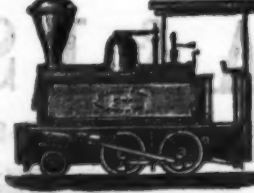


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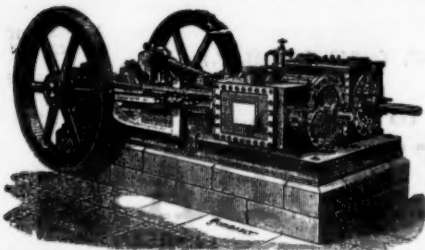
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Supplied to the Indian, Colonial, and other Governments.  
 2500 IN USE in all PARTS of the WORLD.  
**DIAMOND PROSPECTING DRILLS.**

### "OPTIMUS" COMPOUND ROCK DRILL.

(P. J. OGLES PATENT.)

Consumes 40 per cent. less Compressed Air than any other Drill at the same time giving the most effectual results.

ESTIMATES AND FULL PARTICULARS ON APPLICATION.

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TELEGRAMS: "SCHRAM, LONDON," AL, A.B.C. and The Engineering Telegraph Codes Used.

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SILVER MEDALS AWARDED AT THE ROYAL CORNWALL POLYTECHNIC, 1873 & 1876; GOLD MEDAL AWARDED AT THE GREAT INTERNATIONAL MINING EXHIBITION, CRYSTAL PALACE, 1890.

ONLY AWARDS GIVEN FOR CONCENTRATION PLANTS

### GEORGE GREEN'S PATENT Self-Acting or Automatic Ore Dressing Machinery,

A Special Plant, on a reduced scale, has been erected at the Works by which samples of METALLIC ORES—up to Five Tons may be treated, and the commercial value determined, in this way the most suitable arrangement of Plant is ascertained, a considerable advantage to intending Purchasers of Crushing and Concentrating Plant.

GOLD STAMP AND OTHER MILLS.

**GEORGE GREEN,**  
 THE FOUNDRY, ABERYSTWYTH.

Gold Medal, International Exhibition, Paris, 1889.

Gold Medal, Exhibition of Mining & Metallurgy, London, 1890.

**PURE ALUMINIUM** 98 to 99½ per cent. pure; guaranteed 98 per cent. minimum.

**FERRO-ALUMINIUM, ALUMINIUM BRONZE, &c.,**

For Iron and Steel Workers,  
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 And all Metal Workers.

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WROUGHT IRON WELDED TUBES and FITTINGS for GAS, WATER, and STEAM.

Light Lap-welded Wrought-iron and Steel Tubes  
 (SPECIALLY ADAPTED FOR MINES).

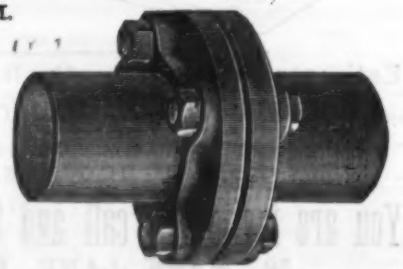
With Patent Flanged Joints (as illustrated) for the Conveyance of Water, Steam, and Air, at High and Low Pressures.

LAP-WELDED IRON AND STEEL BOILER TUBES  
 FOR LOCOMOTIVE, MARINE, AND OTHER MULTITUBULAR BOILERS.

**STEEL & IRON PLATES FOR BOILERS, BRIDGES, &c.**



SECTION OF PATENT FLANGED JOINT



PLAN OF PATENT FLANGED JOINT.

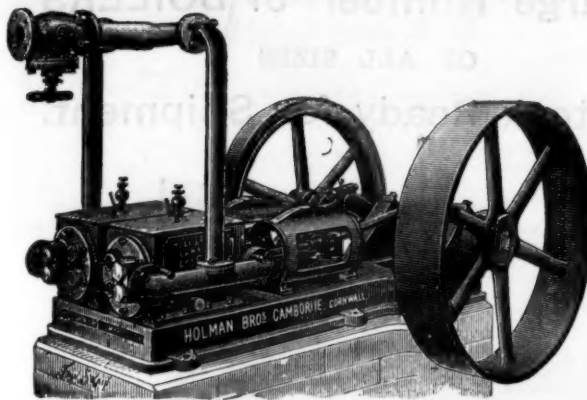
Head Offices: 41, OSWALD STREET, GLASGOW.



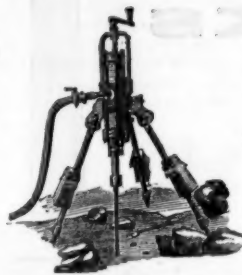
# HOLMAN Bros., Camborne, Cornwall.

ESTABLISHED 1839

Patentees and Sole Makers of  
"THE CORNISH" ROCK DRILL and "THE CORNISH" COMPRESSOR



FIRST  
SILVER MEDAL,  
Highest Award,  
Mining Institute  
Contest, 1881.



FIRST  
SILVER MEDAL  
Highest Award,  
Royal Cornwall  
Polytechnic  
Jubilee Exhibition  
Contest, 1882.

Three Makers  
represented.

Five Makers  
represented.

AWARDED SILVER MEDAL INTERNATIONAL  
INVENTIONS EXHIBITION, 1885.

## RECORD OF WORK DONE

At Botallack Mine, St. Just, Cornwall, **TWELVE MEN** with **TWO** new Patent **CORNISH ROCK DRILLS** drove, sunk, and rose **288 FATHOMS** in **12 MONTHS**, equal to five times the Speed of Hand Labour

At Wheal Grenville Mine, Camborne, Cornwall, **SIX MEN** with **TWO** new Patent **CORNISH ROCK DRILLS** started from the **150 FATHOMS** level and put up in **EIGHT MONTHS** a **11 FEET** by **5 FEET PERPENDICULAR RISE 46 FATHOMS 5 FEET 6 INCHES**, and about midway drove **1 FATHOM 5 FT.** No communication of any kind was effected until holing to the Shaft brought down from surface.

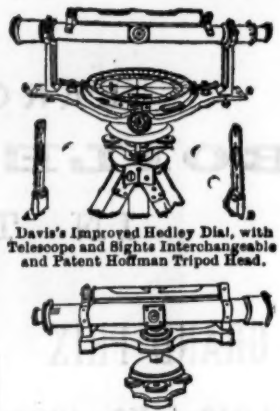
Estimates for **ROCK BORING PLANT** and **GENERAL MINING MACHINERY** on Application.

London Representative: Mr. E. M. TOUZEAU, Leadenhall Buildings, London, E.C.

# JOHN DAVIS AND SON, ALL SAINTS WORKS, DERBY; 118, NEWGATE STREET, LONDON.



Transit Theodolite with Patent  
Hoffman Tripod Head, and  
Trough Compass.



Dumpy Level with  
Hoffman Patent Tripod Head.

**MINING, SURVEYING AND  
ENGINEERING INSTRUMENTS.  
THEODOLITES. LEVELS.**

Davis's Improved Hedley Miners' Dials with **HOFFMAN  
PATENT TRIPOD HEAD.**  
AND ALL DESCRIPTIONS OF **MATHEMATICAL AND  
MINING SURVEYING INSTRUMENTS.**

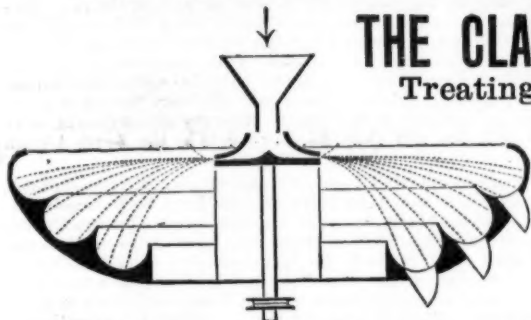
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SECTION (A) MATHEMATICAL DEPARTMENT AND SAFETY LAMPS.  
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Gold Medal Awarded Mining Exhibition, 1890.  
"THE ENGINEERING TELEGRAPH CODE USED."

MR. P. S. HAMILTON (late Chief Commissioner of Mines of  
the Province of Nova Scotia), PRACTICAL GEOLOGIST, MINING  
AGENT and MINING ENGINEER, HALIFAX, NOVA SCOTIA.  
PURCHASES and SALES of MINING PROPERTY effected, with careful  
regard to the interests of clients.

Highest Award at the Mining Exhibition, 1890.

# DRY CONCENTRATION.



**THE CLARKSON-STANFIELD CONCENTRATOR (LIMITED)**, are successfully  
Treating the ores of Gold, Silver, Copper, Lead, Tin, Zinc, Cobalt, &c., &c. of all  
degrees of fineness, from 30 to the finest meshes by their **NEW  
MACHINERY** which may be seen in operation at

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Homogeneous substances, such as Emery, Glass, Sand, Sulphur, Black  
Lead, &c., graded according to size in one operation.

Terms for Experimental Concentration, and for Supply of Machines on Application.

## NEW PATENTS.

LIST of APPLICATIONS for New Patents relating to Mining  
Metallurgical, Engineering, Railway and kindred matters,  
specially compiled from official sources for the "Mining  
Journal" by Messrs Rayner and Company, Patent Agents,  
37, Chancery Lane, London, W.C., who will forward all in-  
formation regarding them free on application.

- 8499 William Russell Cummins, 6, Roseangle, Dundee.—An improved method of protecting the tube plates and tube ends of fire tube boilers.—April 30.
- 8524 Thomas Bradford Bates, 34, Ozenor Road, Stoke Newington, London.—Improvements in chains.—April 30.
- 8523 Tom William Baker, Broad Street House, London.—Steam generators and refuse furnaces combined.—April 30.
- 8553 Frederick Lennox Broughton and James Fieldhouse, 15, Southampton Buildings, Chancery Lane, London.—Improvements in the manufacture of tubes.—April 30.
- 8578 William Joseph Starkey, Barber Starkey, 70, Market Street, Manchester.—Improvements in and connected with wind motors.—May 1.
- 8571 Wilfred Le Plastrier Webb, 13, Tivoli Place, Cheltenham.—Improvements in oil and gas motor engines.—May 1.
- 8592 William Harvey Berry, 45, Southampton Buildings, Chancery Lane, London.—Improvements in steam boilers.—May 1.
- 8585 Charles Maurice Allen, 45, Southampton Buildings, Chancery Lane, London.—Processes of and converters for smelting and refining ores.—May 1.
- 8599 William Phillips Thompson, 6, Lord Street, Liverpool.—Improvements in roller grinding mills.—May 1.
- 8637 William Adolphus Scott, jun., 24, Southampton Buildings, Chancery Lane, London.—Improvements in coverings for boilers.—May 1.
- 8646 Samuel Lesem, 53, Chancery Lane, London.—Improvements in rock drills.—May 1.
- 8658 Thomas Peacock, Grenville House, Brook Street, Hanley, Staff.—R story tippler.—May 2.
- 8668 Tom Clifford Hogg and Joseph Grov, 87, St. Vincent Street, Glasgow.—Improvements in oil or gas engines.—May 2.
- 8688 Charles Hessey Stubley, 2 Whitehead Street, Robin Hood Chase, Nottingham.—Improvements in apparatus for sifting.—May 2.
- 8691 James Baldwin, Blitler House, Blitler Street, London.—Improvements in the construction of valves.—May 2.
- 8747 Edward Arthur Wyatt, 4, South Street, Finsbury, London.—Improvements in apparatus for lowering and raising weights.—May 2.
- 8777 James Lordford, Staiford, Barnsey.—Improvements in means for attaching mottles to colliery corves.—May 3.
- 8804 James Boigiano, 52, Chancery Lane, London.—Improvements in self-heating sad irons.—May 3.
- 8821 Ellis Freeman Edgar, 52, Chancery Lane, London.—Improvements in vertical tubular boilers.—May 3.
- 8843 John Boch, King Street Ironworks, Cheltenham.—An automatic brake or self sustaining lift gear.—May 4.

## SPECIFICATIONS PUBLISHED.

7541, Calow and others, pit cages, hoists, &c., 1893; 7671, Boulé, lifts, hoists, &c., 1893; motive power engines, 1893; 11,495, Bateman and others, looms, 1893; 12,407, Abell, vacuum pumps, 1893; 12,916, Matthews, metallic moulds, &c., 1893; 13,562, Sandbrook, miners' safety lamps, 1893; 1621, Galloway, steam generator, 1893.  
The above specifications published may be had of Messrs. Rayner and Company 37, Chancery Lane, London, at 10s. each including postage.

The new cyanide works at the Princess Company are expected to start work shortly. The plant is of the most modern design, and is calculated to treat 3000 tons a month.

## CONTRACTS OPEN:

FOR MINE, QUARRY, RAILWAY, AND ENGI-  
NEERING WORK, STORES, &c.

\* We shall be obliged by being promptly placed in possession of particulars regarding contracts open for competition, and of the results of successful tenders. In the latter case contract prices should be given.

The date given is that by which tenders must be delivered, in nearly all cases further information can be obtained on application at the addresses given. In applying for such the name of "The Mining Journal" should be mentioned as the original source of the information, concerning which further particulars are required.

## HOMER CONTRACTS.

Dock Works, May 21 (Belfast).—The Belfast Harbour Commissioners have extended the time during which tenders may be lodged for the construction of the extension of the branch dock at the south end of Spencer Dock into Prince's Dock.

Fencing, May 23 (Birkenhead).—For supplying and fixing about 650 lineal yards of wrought-iron unclimbable fencing, together with gates, &c., at the Gillingham Estate, for the Corporation. Plans and specification may be seen, and forms of tender obtained at the office of Mr. Charles Brownridge, A.M.I.C.E., borough engineer and surveyor, Town Hall.

Extension of Waterworks, May 24 (Cork).—For the extension of Little Island Waterworks for the Cork Rural Sanitary Authority, according to plans and specifications to be seen in the Board Room, Cork Workhouse.

Wagon Springs, May 30 (London, E.C.).—For the supply and delivery of laminated bearing springs for wagons, for the East Indian Railway Company, as per specification and drawing to be seen at the company's office, Nicholas Lane, E.C. Tenders are to be sent to Mr. A. P. Duncan, secretary.

Coal, June 1 (Kildwick).—For the supply of the whole or a part of 3000 tons of best screened gas coal or nuts, to be delivered free at Kildwick, during 12 months ending June 30, 1895, for the Kildwick Parish Gas Company. The coal to be delivered at such times and in such quantities as the manager may direct. Tenders to be sent in by June 1. Mr. Fred H. Pickles, manager and secretary, Gasworks, Kildwick.

Coal, June 5 (Staines).—For the supply and delivery of 6000 tons of Best Pontop, New Felton, or other gas coal, for the Staines and Egham District Gas and Coke Company (Limited). The deliveries to commence after November 1, and to continue during period ending September 30 following. Forms of tender, containing further particulars, may be obtained upon application to the secretary.

Bridges, June 5 (Trinton).—For supplying and fixing a Stoney's patent pinstock, 9 feet by 18 feet, two steel or wrought-iron bridges, building of walls, and other works in the French Weir Field, for the Corporation. Plans and specifications to be seen and particulars obtained of Mr. James H. Smith, borough surveyor, Municipal Offices, Castle Green.

Fencing, (Amesbury, Wilts.).—For erecting about 200 yards of fencing at Stockbottom, Amesbury, and about 250 yards near Wilford School, for the Amesbury Highway Board. Specifications and particulars to be obtained of Mr. J. T. Huxham, district surveyor, Amesbury.

A SCARE IN THE WEST END occurred late the other night when it was rumored that war had been declared between France and Germany. The possibility of such an outbreak being imminent created the wildest excitement and alarm. And no wonder, for the result would, indeed, be fearful. But, after all, is not a war equally terrible and far more fatal being waged every day in our midst? Every day, in civilised England, men and women are fighting against the countless legions of disease, and often, alas! they are ill-equipped for the struggle. Let them lay in a stock of Holloway's Pills. Against such artillery ill-health can make no headway. Giddiness, liver complaints and all impurities of the blood fade away like Malakale before the Maxim gun.

## OUR INQUIRY COLUMN.

TO CORRESPONDENTS.

Correspondents will please take note that all communications will in future be answered in this column and not through the medium of the post. All questions and replies should be accompanied by the name and address of the writer.

## REPLIES.

- A. B. C.—Hold; they will rise.
- K. J.—A very fair lot.
- D. W.—The result has not been made known yet.
- D. S.—Sell out entirely.
- C. B.—We do not fancy them.
- NEWCASTLE.—Speculative, but fair.
- LEX.—We should sell.
- DISAPPOINTED.—Nothing is known yet as to any reconstruction.
- CANADIAN.—The sum you mention is inadequate for the purpose; you would require at least double. Why not commence operations on a smaller field and be guided by its progression; the immediate surroundings are certainly extremely favourable for your project, and we think you would have a very fair chance of success.
- B. B.—Thanks for notification. We will give the matter our attention in due course.
- YORKSHIRE.—(1.) It is extremely doubtful. (2.) We would rather you exercised your own judgment in this. (3.) That is a matter on which only an expert personally acquainted with the property can give reliable information. (4.) We do not think so. We believe in their honesty.

EXHIBITION AT BUCHAREST, 1894.—The Department of Science and Art has received, through the Foreign Office, a despatch from her Majesty's Chargé d'Affaires at Bucharest, announcing that the co-operators of Roumania propose to hold their fourth exhibition at Bucharest this year, to commence on the 26th of August, and to close on the 12th of November. In order to encourage foreign manufacturers to take part in the exhibition, space is to be set apart for an International Section, in the hope that the relations between Roumania and the various countries with which she is in commercial intercourse may be strengthened thereby. The exhibition is stated to be of a private character, but it will be under the patronage of their Royal Highnesses the Prince and Princess of Roumania, and, as on previous occasions, his Majesty the King has announced his intention of exhibiting agricultural and industrial products from the royal and personal domains. Any information which may be required by intending exhibitors will be supplied on direct application to M. Boutoulesco, the President of the exhibition, 11bis, Rue Clementi, Bucharest.



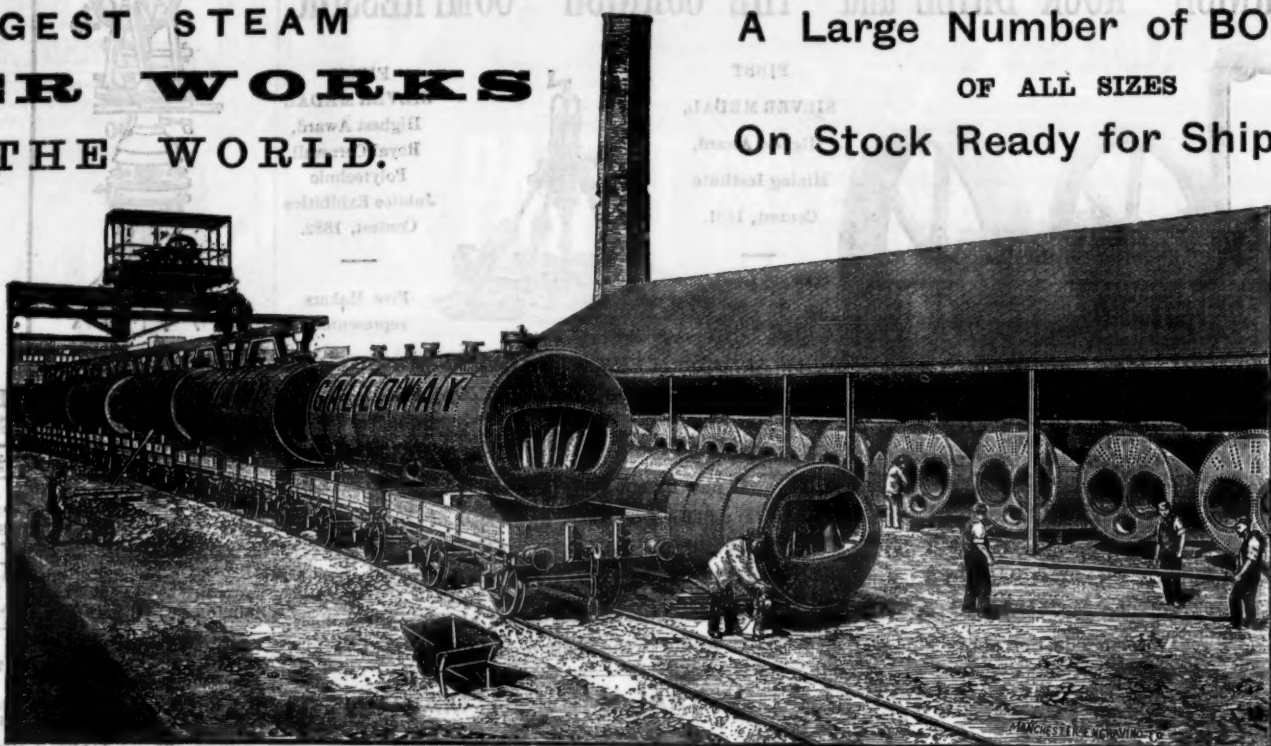
# GALLOWAYS, LIMITED,

## MANCHESTER.

LARGEST STEAM  
**BOILER WORKS**  
IN THE WORLD.

A Large Number of **BOILERS**  
OF ALL SIZES  
On Stock Ready for Shipment.

GRAND PRIX  
PARIS, 1878 & 1889  
GOLD MEDALS  
AT ALL REGENT  
EXHIBITIONS.



### HOW RUBIES ARE MADE.

#### PROFESSOR JUDD'S FINAL LECTURE.

IN his final lecture on "Rubies," on Tuesday, at the Royal Institution, Professor Judd gave some interesting facts as to the production of artificial rubies. The ruby, as he had already explained, is pure crystallised alumina, or oxide of aluminium, known to mineralogists as corundum. To secure the crystallisation of alumina many processes have been adopted by different investigators, but the most successful have been those of the distinguished French chemist Frémy, recently deceased. His first plan was to take pure alumina (a white amorphous powder), mix it with oxide of lead, and heat the whole in a silicious crucible, when crystals of alumina formed on the side of the crucible. Later on he heated together pure alumina, potash, and fluoride of barium, with a similar result. In both cases it was found necessary to use a salt of chromium to give the characteristic ruby colour to the corundum thus formed. Sometimes blue crystals of turquoise and bluish-pink crystals of amethyst were found amongst the mass. Nevertheless, Professor Judd has given in his previous lectures reasons for believing that the chromium does not act as a colouring matter, but only fulfils what the chemists term the functions of a "mineraliser." The researches of the French chemists have been followed by others in England, and Professor Judd was able to exhibit a number of artificial rubies prepared in this way. The art of ruby-making is now extensively practised. The gems thus produced are known in the trade as "Geneva" rubies, and are largely used for jewellery watches, while we need hardly doubt that many pass muster for the natural stones themselves. The artificial ruby is just as hard and brilliant as the natural gem from Burmah; its chemical composition and molecular structure are identical, and it is only slightly inferior in the matter of its colour and "fire." It has been said that the artificial ruby will not "glow" in a vacuum tube when exposed to electric bombardment, but Professor Judd disproved this theory by a single experiment. One test alone the Professor knows to be reliable, and that is the microscope, which is able to search into the little "included" bubbles, which are as common in the substance of artificial as in natural corundum. The bubbles in the natural ruby are filled with water, salts in solution, and even carbonic acid gas liquified under intense pressure, whereas the bubbles of the artificial gem are filled with a vitreous substance proceeding from the fused matrix on which the crystal was formed. In conclusion, Professor Judd said that although modern science has dissipated all the fancies and mysteries associated with this very wonderful gem by the ancients, there, nevertheless, remain plenty of real mysteries about it to be cleared up yet by the chemist, the physicist, and the geologist.

**THE PANULICILLO COPPER COMPANY (LIMITED).**—An extraordinary general meeting of the Panulicillo Copper Company (Limited) was held on Wednesday, at Winchester House, for the purpose of considering and, if thought advisable, passing resolutions authorising the sale and transfer of the undertaking and assets of the company to a new company to be formed upon the terms of the scheme set forth in the prospectus of that new company; and approving the draft agreement submitted to the meeting and embodying the proposals. Mr. F. J. Johnston, who presided, stated, in moving the resolutions, that an informality had invalidated the proceedings of the previous meeting, so that it had been found necessary to hold another one. As he had then explained, the liquidators had succeeded in their negotiations with Chili in getting the railway company to consent to a considerable abatement of their charges. The English creditors, moreover, had agreed to accept priority shares for their debts, and since the last meeting a considerable fall in exchange had taken place, which would enable them to discharge the company's debts on a much lower basis. Looking at all the circumstances, therefore, the position of the company seemed to hold out more advantages than was the case two or three months ago. The resolutions were seconded by Mr. Bond, and carried without dissent.

SOME very rich assay results have been obtained (says the *South African Mining Journal*) at the Geldenhuys Estate. On the fourth level a return of 15½ ounces to the ton was secured.

**NEW COAL FIELDS IN RUSSIA.**—The discovery in the Government of Krasnoyarsk, Siberia, of immense coal fields is announced. In the neighbourhood of Kabanoff the rich and deep seams rise close to the surface. At Atschinsk the deposits are said to be even more extensive and valuable. The brown coal in most places overlies the anthracite beds.

### MINING AT THE ANTWERP EXHIBITION.

FROM OUR OWN CORRESPONDENT.

SEEING the general distrust which is expressed nowadays in the commercial value of exhibitions, and the comparatively recent occurrence of such an international bazaar at Brussels, the wisdom of Antwerp's proposal to hold an Exhibition this year might very well seem open to question. The city on the Scheldt has, however, such strong advantages of position and circumstance that it can afford to be venturesome. The Great Eastern Railway has made it an important centre for the transmission of that enormous stream of Continental visitors which is always flowing from and across England, and Antwerp may be sure of crowded hotels this summer if only its attractions are found equal to its opportunities. The commercial progress of Antwerp of late years has, unfortunately, been brought home to the British mining and metallurgical industries by the severe and direct instrumentality of Belgian competition in all our markets. Even as one travels on the river along the famous quays which border the Scheldt, one can understand how it is that Belgian enterprise has become so successful in all classes of iron and steel, engineering, machinery, and general metal work. The use of ironwork as an integral constructive material, capable of conversion to uses of ornament, and not merely a utilitarian device to be carefully concealed by stone or brick (as is our English custom), is apparent in all the new buildings going on in the city, as well as in the riverside sheds themselves. It is not, therefore, surprising, when one leaves the steamer, to find that iron joists and girders, bridges and caissons, form a very large part of the material which is being dispatched from the port.

It is in this aspect of the Belgian competition with our own metallurgists that the Antwerp Exhibition will present one of its greatest points of interest for the readers of *The Mining Journal*. And of this point the Exhibition is very illustrative indeed. Foreign nations' exhibits are in so backward a state that they can scarcely be said to be displayed at all. But the Belgian section is nearly complete, and one of its strongest features is the proof which it gives of the growing efficiency of the country's metal-working industries. The examples of wrought iron work which are scattered throughout the section prove that the art of Quentin Matsys and his emulators has not died out amongst the Flemings, and it is clear from their excellent taste and execution that cheapness has not been the only factor in establishing Belgium's foreign trade. The trade "trophies" which have been put up by some of the native metal working firms are of quite a French quality in taste and workmanship.

To come to heavier branches of the metal industries we are reminded of a recent triumph for Belgian enterprise in the Société Cockerill's exhibit of a model of the "Marie Henrietta," as well as by the marine and horizontal land engines which they and other firms show in the Machinery Section. One of the engines only has, so far, been set to work, and it runs with an ease which shows the highest class of construction. The locomotives which have been erected in the centre of the section are also models of finish and workmanship, and are not discredited by the specimens of a locomotive's motions as they leave the milling machine shown by the Lancashire and Yorkshire Railway Company. In gas engines, also, the Belgian firm's make an attractive show. In another class of heavy work, the Exhibition should do a good deal to establish their reputation. Belgium has long been supposed to be far inferior to England, France, and Germany in the manufacture of ordnance, armour-plates, and other military and naval material. However, the cannon and the iron and steel armour-plates shown prove that her metallurgists have made vast strides in this direction, while the armoured cupolas manufactured by the Ateliers de la Meuse represent a distinct advance upon previous practice. The huge crank shaft forging shown by the Société Cockerill is also a piece of work of which even Sheffield may be proud. In this connection it is worth remarking that most of the great Belgian steel making concerns are now equipped with hydraulic presses of as huge a capacity as any in other countries. The splendid work which is being done in the Exhibition by the Belgian soldiers in laying pontoon and other bridges may also be held to redound to the credit of the native metallurgists and engineers. A huge trophy of tubes is another testimony to Belgian success in this branch of industry as far as other nations are concerned. So far as can

at present be judged, the display in metallurgy and engineering will hardly bear favourable comparison with that of the home firms. The Germans, as usual, are well to the front. Their exhibit includes a new type of diamond drill. France shows some artillery and heavy steelwork. America, so far, has not yet completed the erection of the building in which it will house its exhibits, and the display made by England is altogether a poor one. In the Machinery Section at present the most prominent objects of British manufacture are a Babcock-Wilcox, and a Galloway boiler, and it seems hardly likely that the final effect will be a very imposing one. The United States' exhibits, in this section seem principally to comprise agricultural implements, although Messrs. Frasier and Chalmers will show a five stamp gold battery at work on the Witwatersrand quartz, as an adjunct to the very complete show made by the South African Republic in a handsome pavilion of its own.

To turn from metals to mining, Belgium is again pre-eminent. It is no doubt here that other nations have been largely exhausted of the thirst for such displays by the Chicago Exhibition, but in such an international centre as Antwerp it seems somewhat of a pity that the home country should be left to crow it unchallenged. The Belgian collieries make a very complete display of models and machinery illustrating their methods of working. There is much in this to attract the attention of English mining engineers, more especially in the apparatus for washing the coal and for transporting it. The Société Vieille Montagne make, as might be expected, a commanding display of zinc in all its conditions, from the crude metal to every form of manufactured goods. The flag of a British colony hangs, however, over the most interesting mining exhibit in the show, though it is not included in the British Section. This is the diamond washing machine which the De Beers Company have sent over from Chicago, and which Mr. Lewis J. Atkinson has temporarily left the Cape Court of the Imperial Institute to manage. When this is at work visitors to Antwerp will be able to see the "blue ground" from Kimberley put through all the processes which are necessary to separate the diamonds from it. Two sturdy Zulus and a number of white men will be employed in the work. The De Beers Company will also show in an ingenious case, manufactured by Messrs. Chubb, which disappears through the floor, a selection of uncut diamonds. This exhibit altogether ought to do a great deal for the diamond cutting industry of Antwerp, which is now rapidly growing at the expense of Amsterdam. Diamond cutting and polishing will be shown in operation, near the De Beers stand, by the local firms, all of whom are represented in a collective kiosk. Next door to this the Belgian Government is showing minting machinery at work, and altogether this, it may safely be prophesied, will become the most interesting corner of the Exhibition.

The quartz crushing mill has already been referred to. There is a "side show," illustrating the methods of gold mining in a typical American mine. The Transvaal pavilion itself will contain a complete range of all the ores hitherto mined on the Witwatersrand, as well as a representative selection of quartz from the De Kasp, Lydenburg, and Silati districts. The wonderful wealth of South Africa will be further illustrated by specimens of coal from the Boksburg and other fields, Swaziland tin, silver, lead, and other minerals. As a whole, this display will probably do a great deal to encourage the present tendency amongst Continental capitalists to take a hand in the development of the mineral resources of that part of the world. The Congo settlement, which is an important feature in the attractions of the Exhibition grounds, will remind Belgians how successful their own national enterprise in Africa has been and may nerve them on to extend it in new directions.

As a pleasure resort the Exhibition deserves unstinted praise. It has a Cairo street, a troupe of performing savages, an Algerian pavilion, and a reproduction of Old Antwerp, which is simply a triumph of artistic skill and devotion to detail.

EXPERIMENTS are about to take place at the New Primrose, with a view to ascertaining whether better results are obtainable from Free vanners, by means of properly sizing the pulp. A stream from 10 stamps will be led into hydraulic separator, so constructed as to divide the pulp into four classes. Careful samples will be taken of the pulp passing on to each vanner, as also of the concentrates.

It is stated that when the 20,000 ton cyanide plant of the Geldenhuys Estate Company starts, about the 18th July, 5000 ounces per month will be won by means of cyanide, and together with the mill returns, £17,000 per month profit will be made.

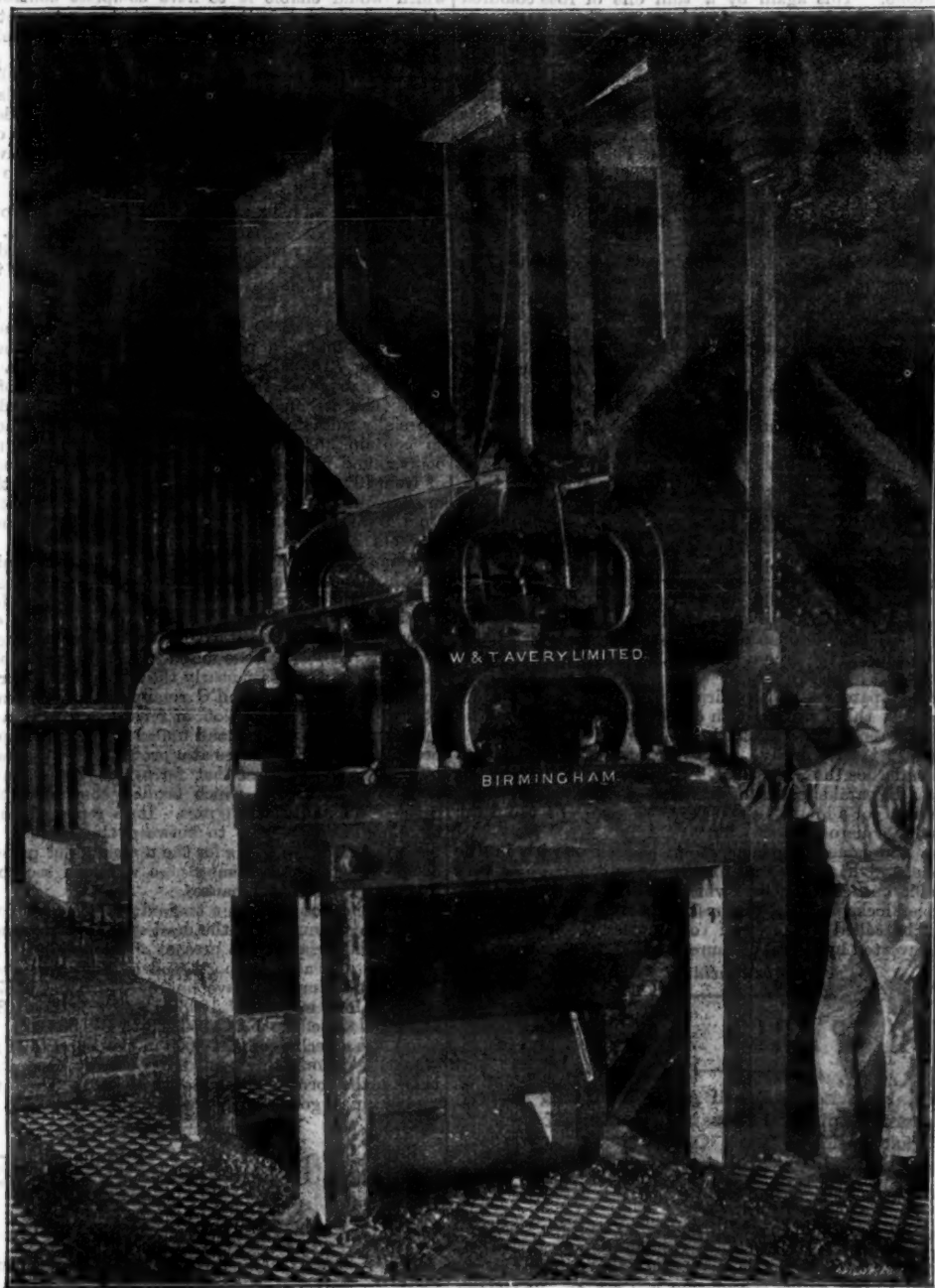


## MECHANICAL ENGINEERING: MACHINERY, MINING and RAILWAY PLANT, &c.

Illustrated Descriptions of New and Standard Mechanical Appliances, Accessories and Processes, adapted to Mining, Metallurgical, Railway, Engineering and other Industrial Purposes.

### COAL WEIGHED AUTOMATICALLY.

MESSERS. W. and T. AVERY, of Birmingham, have recently introduced a machine (of which we give an illustration) capable of accurately weighing and registering one of the most difficult of products so to be dealt with—viz., coal—and the machine can hardly fail to be of value in many departments of colliery work. Hitherto the great difficulty to be overcome in the construction of such an apparatus has been to prevent the coal dust from clogging the various parts of the machine, and the irregularity in the size of coal.



Briefly, the machine is constructed as follows:—The weigh hopper is suspended on an equal armed beam, standard weights being used as a counterpoise. The coal is fed into the machine during the weighing course in a regular and intermittent stream by means of Richardson's patent feeding apparatus. At the set-off the stream is copious, but just before the required amount has entered the hopper it is reduced to a small dribble. When the beam balances this is cut off by means of a falling gate, which is instantly locked, preventing a further supply, while the hopper automatically discharges its load. This having been completed, the weighing is registered on a dial, and the machine automatically sets itself again into operation, and receives the next weighing. The great aim has been to prevent the possibility of the parts getting clogged by the observance of an extreme simplicity in their construction.

The machine is said to be more particularly useful for plants where coke is made out of the small dust and slack which passes through the screens after the house coal has been extracted. The method adopted is to bring the slack from the screens by means of a travelling belt or conveyor, and discharge it again in 1 ton or ½ ton weights into the stock hoppers supplying the working plant.

### PROGRESS IN ELECTRIC LIGHTING AND TRANSMISSION OF POWER.

NOTWITHSTANDING the prolonged strike in the coal trade, and consequent paralysis of the manufacturing industries and trades generally, the past year has been a very busy one in electric lighting and power work as applied to mining and the manufacturing industries generally. Messrs. John Davis and Sons, of All Saints' Works, Derby, we learn, have carried out a large number of lighting, pumping, and hauling contracts at various collieries, in addition to a number of mills, factories, shops, and complete plants for country residences.

A colliery pumping plant, recently installed by this firm for the Ackton Hall Colliery Company, near Pontefract, consists of

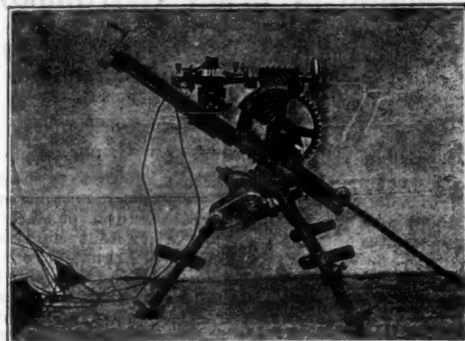
25-horse power motor and pump, forcing 12,000 gallons per hour up a vertical height of 280 feet. The cables are of the concentric type, insulated with vulcanised india-rubber, and carried down the shaft in wrought iron pipes as an extra precaution against mechanical injury. Another small pump and motor to force 360 gallons per hour up a vertical height of 1200 feet is also at work. This plant was an emergency one, and was started to work by Messrs. John Davis and Son within 10 days of receipt of the order.

A combined lighting and pumping plant, with a motor constructed under the Davis and Stokes patent, has quite recently been erected for Messrs. The Clay Cross Company at their Morton Colliery. The lighting consists of lamps varying from 16 to 150 candle power on the surface and underground, in addition to a number of lamps, a 3 h.p. Davis and Stokes patent safety commutator motor, driving a three throw pump, forcing 600 gallons per hour up a vertical height of 128 feet through 2400 feet of 2 inch pipes. The motor and pump is situated 1 mile from the dynamo, and is now doing in one quarter of the time three times the work originally done by horses.

Another extensive pumping plant with spare power for lighting, just erected by Messrs. John Davis and Son for the Wingerworth Colliery Company, near Chesterfield, for clearing

### THE "MONARCH" PATENT ROCK DRILL FOR ELECTRIC POWER.

The arrangement here illustrated shows an adaptation of the "Monarch" Hand Power Rock Drill, which we recently described in this paper, to electricity, and has



proved such a success that the manufacturers are now able to offer an electric-driven rock drill, which is a good practical tool for all mining, sinking, and quarry work. The percussive portion of the drill is combined with and actuated by a small electric motor, so adapted to the machine that while the drill may be fixed or worked at any angle, the motor maintains its proper position for working, the whole forming one complete and yet portable machine, the percussive portion of which takes, as it should do, all the strains of drilling, while the motor simply provides the power, without being subject to or affected by the percussive strains. This drill will strike about 350 to 400 blows per minute, and only needs the cable connection with the dynamo. The cable may be of any length, with very little loss of power, and the whole machine is portable, and may be easily removed as the work requires it. In many places electricity is available, or may be procured by water or other power at small cost, and under such circumstances these drills should be found very economical in working.

These machines may be obtained from Mr. J. H. Weatherdon, 37, Queen Victoria Street, London, E.C.

### CARROCK FELL.

#### A STUDY IN THE VARIATION OF IGNEOUS ROCK MASSES.

##### Part I.—The Gabbro.

By ALFRED HARKER, Esq., M.A., F.G.S.

THE paper opened with an account of the general relations of the intrusive rock masses of the district, and proceeded to deal more particularly with the gabbro, which forms the earliest intrusion.

A petrological description of the Carrock Fell gabbro was followed by a study of the variations observed in different parts of the mass. The rock becomes progressively more basic from the centre to the margin, passing from a quartz gabbro with as much as 59½ per cent. of silica to an ultrabasic type with as little as 32½. The latter in extreme cases contains nearly 25 per cent. of iron ores, partly titaniferous. This was compared with the igneous iron ores described by Vogt in Scandinavia, &c., and the probable physical cause of remarkable variation in the gabbro was discussed.

Other modifications of the gabbro were briefly noticed, due on the one hand to metamorphism of the rock by a somewhat later intrusion of granophyre; on the other hand to the gabbro-magma having enclosed considerable masses of the basic lavas of the district, which are themselves highly metamorphosed.

##### Discussion.

Mr. MARR believed that the age of the gabbro intrusion had yet to be determined. The author's work had for ever set at rest the idea that the gabbro had been formed by alteration of the volcanic rocks of the Eycott group; for the proofs of intrusion of the gabbro into these were complete. The mode of occurrence of the gabbro and granophyre reminded him of the description of masses of these rocks in Scotland, about which the society had recently heard much. These were points of local interest, but the main object of the paper was to describe the variation in the different parts of the gabbro mass, and from what he had seen of the district he believed that the author had established his points.

Professor JUDD congratulated the author of the paper on taking up this highly interesting district of Carrock Fell as a subject of study. He bore testimony to the careful investigation of the area by the late Clifton Ward. The author's observations seemed to show that concentration by crystallising processes might go on in a mass of large dimensions, as well as in dykes like those described by Lawson and Vogt.

Professor COLE expressed the regret which all must feel that Professor Sollas could not be present to join in the discussion. The parallelism of the so-called granophyre and the several layers of the basic rocks seemed to suggest that the whole Carrock Fell mass might be a huge composite dyke, the acid rock having intruded into the gabbro distinctly on the north, and farther south as a plexus of minute interpenetrations along the central line of the gabbro, giving rise there to the gabbro with micropegmatitic ground mass. The microscopical sections seemed to him to support this view, by reason of the contrast between the basic areas and the patches of micropegmatite. The aggregation of iron ores on the margins of the gabbro must, however, be explained by some such theory as that which the author put forward.

Mr. RUTLEY considered that one of the most interesting points in this valuable paper was the occurrence of lavas of the Eycott series in the gabbro. How portions of lava flows should become embedded in a plutonic rock was a problem which seemed to need further elucidation. The question whether the more acid character of the central portion of the gabbro was due to differentiation of the original magma, or to incorporation, by fusion of apophyses from the adjacent granitic rock, was an open one; but it seemed probable that, if the latter hypothesis were the true one, the alteration, where the gabbro was seen to come into contact with the granitic rock, should extend over a wider area than that represented in the section.

The AUTHOR thanked those who had spoken for their remarks. In reply to Professor Cole, he said that, while believing in a probable genetic relationship between the granophyre and the gabbro, he did not think that the injection theory of Professor Sollas afforded any explanation of the regular distribution of the more or less acid varieties of the gabbro.

Replying to Mr. RUTLEY, he described the occurrence of the masses of Eycott lavas enclosed in and intricately veined by the gabbro, but always with a sharply defined junction. All the phenomena negatived the hypothesis of a metamorphic origin for the latter rock.

\* From a paper read before the Geological Society of London.

he flooded workings, is now situated 1 mile from the dynamo, and is forcing 12,000 gallons per hour up a vertical height of 150 feet through 2400 feet of 7 inch pipe. In order to deal with the water more quickly, a duplicate plant is now being constructed to deliver its water on the surface.

As a type of an export plant we may describe that supplied to the St. John Del Rey Gold Mining Company for lighting their stamp mills, shops, yards, engine houses, mines, and managers' residences with arc and incandescent lamps. The plant consists of a compound wound dynamo specially constructed for transport, driven by a Pelton water wheel switchboard, with regulating and controlling switches, measuring instruments, lamps, brackets, fittings, &c., complete. The dynamo is situated a distance of 1 mile from the nearest lamp; the pressure is, however, kept constant at all roads by means of a special arrangement of connections designed by Messrs. John Davis and Son.

These are only a few of the most recent plants erected by Messrs. John Davis and Son. The list of work executed during the last 12 months containing, amongst others, the Lea Lead Works of Messrs. Wass and Sons, and a number of collieries and works.

WEST AUSTRALIAN GOLD FIELDS.—The *Central News* says:—Later mail advices from Western Australia state that there is no abatement in the Coolgardie "gold boom." Most of the fields continue to show gold heavily, and the influx of diggers is very large, notwithstanding the issue of notices warning the men that adventurers without capital will almost certainly be disappointed. On March 27 the gold escort from Coolgardie took 1700 ounces from Perth on behalf of the banks, and of that 750 ounces were carried in the waistbelts of three diggers on the road. Two men, Mr. D. F. Driscoll and Mr. W. A. Jones, both of Sydney, arrived at Adelaide from Perth on Sunday, April 1, with 24 pounds weight of gold dug out by them with their knives in the gully at Kurnalpi (Coolgardie). There were only 15 pieces of the gold, and the largest weighed 37 ounces. A public exhibition of the gold was given on the 2nd ult. Mr. Driscoll, who is an old gold miner, strongly advised that nobody should go to the Western Australian fields without capital.



## SPECIAL CORRESPONDENCE: COLONIAL AND FOREIGN.

### MINING IN SPAIN (ASTURIAS).

#### THE COAL FIELDS OF ASTURIAS—THEIR GREAT IMPORTANCE.

(FROM OUR OWN CORRESPONDENT).

GIJON, MAY 6, 1894.

IT does not appear to be generally known that the carboniferous formation of this province is important, and that there is here an abundant supply of coal for all purposes. Many estimates of the fuel supplies of different countries have been made, and the known coal fields of Europe have been well examined, and their contents calculated; and in looking forward fears are entertained for the continued welfare of the respective nations, since at the present increasing rate of production a few hundred years will see these sources of power and wealth exhausted, or their exploitation will be impracticable, owing to the depths at which the remnants must be worked.

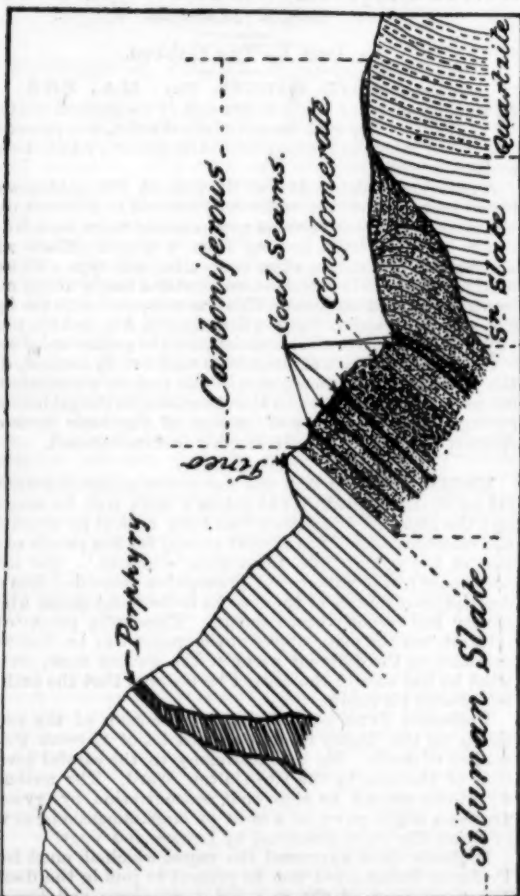
It is strange that the coal measures of Asturias have been left out of all such estimates, notwithstanding their importance, owing to their numerous and regular seams, the facilities for working them, in view of the topographical features of the country, the quality of the product, and their proximity to seaports.

The object of this and succeeding communications is to draw attention to this field with a view to see it included in future in the estimates of the world's supply of fuel.

By referring to the partial geological maps, published in the Journals of 16th February and 17th March of the present year, it may be noted that in addition to the general central coal field there are several isolated patches. Some of these have peculiar features; their examination raises problems in geology difficult of solution. It will be well to review these separately as an introduction to the great central field which will be divided into rich and poor carboniferous measures.

These isolated patches are five in number. Some of them appear to be cut-off portions of the general system, whilst others appear to be older, and no other cause can be assigned for their mode of occurrence than the shifting of the older strata to overlap them in concordance through vast lateral pressures.

The following section (extracted from the map of Don Guillermo Schulz) will show the position of the Tineo coal measures:—



This is unique amongst the isolated patches, as its fauna is partially dissimilar to that of the other portions of the series. Nevertheless, the characteristic fossils are distinctly carboniferous.

They are as follows:—Pecopteris of five classes, sphenopteris tenuifolia, calamites undulatus, and calamites dubius, besides several varieties of asterophyllum. Here there are several seams of anthracite, worked for household purposes. The quality of the coal has undoubtedly been influenced by the eruptive mass in the vicinity, which explains their meagreness in hydro-carbon. The enclosing walls are slate and sandstone, and the slate has nothing to distinguish it from the overlying country, and that is Silurian. A siliceous conglomerate runs through it in concordance. The salient point about this bed is the enormous thickness of this conglomerate, which for a long distance has a width of about 2000 feet. In some places in this there are thin banks of sandstone having calamites. The whole patch occupies an area of 22 square miles.

To the S.W. of this there is another isolated patch of carboniferous. This lies in concordance on flat black Silurian slate. Its base consists of grey sandstones; above this, conglomerate, sandstone and shale, with five important seams of anthracite and culm. The sandstone roofs of these seams hold numerous specimens of plants, pecopteris predominating. Its area is approximately 9 square miles.

The Arnao patch was referred to in the Journal of March 17. Some distance inland this is found to hold two parallel seams, 5 metres thick, with interlying beds of clay slate and sandstone. Examination of these shows that they are one and the same seam, doubled up to their present position by lateral pressure.

Their flora is characteristic, comprised of calamites cannaeformis, calamites approximatus, pecopteris, cyathes, cyclopteris and neuropteris; no sigillaria, and no lepidodendrons, so abundant in the central coal measures.

The next isolated patch to refer to is that of Teberga. This lies on the Devonian boundary on the east by a nearly vertical dark fetid limestone range, which reposes on the Devonian.

Overlying this limestone to the west are alternating banks of carboniferous shale with sandstone, having numerous seams of coal of from 3 to 6 feet thick.

Towards the south carboniferous sandstone predominates, alternating with beds of shale having nearly a vertical pitch, and still farther south, a section cut through by the River Villa shows the same series of alternating sandstone and shale, together with some thin banks of limestone, and the outcrops of six seams of coal, dipping sharply to south-west.

A short distance farther south from this there is an enormous bank of siliceous conglomerate, having a width varying between 800 and 1600 feet, pitched nearly vertical. This can be followed without a break for over 6 miles towards the south-east. This appears to be the same conglomerate as is met with in the Tineo basin, and also in the central field, to be afterwards referred to. Still further south than the conglomerate there are some outcrops of coal seams, which may be the same ones as are met with to the north of it. The conglomerate would thus be doubled up, thus accounting for its thickness, and form the axis of a great synclinal.

The carboniferous on the west is accompanied by a band of ashy limestone. This again by a thin one of rose coloured marble, then a bed of quartzite, forming a continuous ribbon-like boundary over 3000 feet thick. All the western portion appears to have a concordant dip with this overlying quartzite bed. The dip of the northern portion of the field is in discordance with the Devonian on which it lies. Whilst this latter has a general S.W. dip, the carboniferous on the contrary has a north-east one, although this is irregular, owing to the contortions and breaking up of the strata. The bed has a north and south length of 16 miles, and its width varies from 1 to 7 miles. Taking an average width of 2 miles, its area is 32 square miles. The direction of the coal seams is the line of run from north to south.

The flora is similar to that of Tineo, whilst the fauna is comprised of spirifer mosquensis, spirifer integricosta, productus punctatus, productus cora, orthis striatula, terebratula hastata, arca, euomphalus catillus, pleurotomaria, and cyathophyllum.

Owing to the distance of this field from roads or railroad, and the abundant timber in the district, yielding charcoal for all purposes, the little work that until recently had been done here consisted of excavations on the crops for coal for the smithies of the villages of the district.

Interest has, however, been at last awakened, and the whole of the district has been taken up by several holders. Some of these have done the necessary preliminary work to open up seams and prove their importance. The railway to Concha de Ardo, through Trubia, and another line from Trubia to Aviles, now being studied, will bring this field within reach of a shipping port, as from Trubia to the fields, following the banks of the Rivers Trubia and Teberga, a metre gauge railway can be laid economically, and this branch will have a length of only about 12 kilometres. This field with its iron ore beds was referred to in the Journal of 28th April. In addition to the export of fuel there is a grand country open for the erection of blast furnaces and the smelting of the ore on the spot, to produce pig iron for exportation on a large scale.

The peculiar patch of Santo Firme has next to be noticed. This lies about three miles south of the port of Aviles. The western limit reposes concordantly on the Devonian, and the north and east is covered by the keuper of the triassic, whilst the south underlies the cretaceous. It dips sharply to the east, and encloses 10 parallel seams of excellent coal, which are being (and have been for a long time) worked. The area of the patch is about half a square league.

This has the same component strata as are met with in the central zone, and has the same fossils. It is covered by a very compact siliceous conglomerate which is worked for millstones and crucible blocks for blast furnaces. In this special case the grit cannot be called the farwell rock unless the whole strata have been inverted by lateral pressure in a line from east to west.

(To be continued.)

## OUR PARIS LETTER.

The Metal Markets.—South African Mining Scrip.  
—French Capital in Mozambique and Madagascar.—New Iron Ore Deposits.—  
American Pigs in Europe.—  
Foreign Trade.

THE investing public have been waiting so long for a favourable opportunity to place its money in remunerative undertakings that the moment does not seem to be far distant when a more active speculation will set in. So much money is now lying idle that investors find it almost hopeless to expect that they will be able to put it all into Municipal or Government securities, upon which the rate of interest is exceedingly small. There has been another rush during the past few days to participate in the New Ottoman loan, and the amount required was subscribed for many times over. A great deal of satisfaction is expressed at this readiness to recruit the finances of the Porte, as it will aid French capitalists in their endeavours to secure a firm hold upon Turkish industry and commerce. In the meantime, there is still a plethora of capital awaiting investment, and as home securities are at a premium the public are beginning to pay some attention to speculative undertakings. So far, mining has responded very little to this more active movement. Copper shares are still very weak, and the prices of the metal do not improve. Nevertheless, the continual fluctuations lead to the conviction that an early rise is by no means improbable, as prices having now reached their lowest possible limit, holders are, as a rule, quite content to wait patiently for an improvement. A great deal of manoeuvring has, however, been indulged in with respect to the Rio Tinto shares, but, in spite of the efforts of speculators to secure a rise in order to dispose of their scrip, the price has not advanced beyond 370 francs.

The only branch of mining that meets with any favour is the South African auriferous industry, which is likely soon to become the object of an active speculation. The increasing yield on the Randt is an evidence of prosperity which shakes even the scepticism of the prudent investor, but he still hesitates to put his money in ventures about which he knows practically nothing, except that the Randt gold industry is in the hands of bodies who, he thinks, do not care at all for his interests. This hesitation is bound, sooner or later, to give way, and a great deal of French capital will be invested in South African mines. While the small investor is fighting shy of this class of scrip, the speculator is giving it more attention, and is keeping South African mines prominently to the fore. It is somewhat remarkable that gold mining has not been more actively supported considering the part which French chemists and engineers have played in the economical extraction of metal from the ore. They have done much to make the industry a paying one, but they are

profiting nothing from their enterprise. This is probably due to the fact that nearly every one of the French gold mining concerns that have been formed within recent years have come to grief.

As we have stated above, the investor has very little confidence in the management of the Randt gold mines, and it is evident that he will hold off from this class of scrip until his distrust gives way to personal interest. It is, indeed, very difficult for English and French capital to work in harmony in any undertaking, and while there are certainly numerous exceptions the tendency is yet towards a greater antagonism, by which the common interest is often nullified. Within recent times there has been quite a dead set made in certain quarters against English investments, and in South Africa especially attempts are frequently made to oust out English capital. One conspicuous example of this was afforded in the case of the Mozambique Company, when the French shareholders sought to obtain complete control of the company's affairs, and the same influence is now at work in Madagascar, where important mining concessions have been made over by the Hova Government to English capitalists. These concessions are a constant source of irritation to the French, as their efforts to monopolise the market have thus been entirely frustrated, and the Government has been repeatedly urged to convert its protection into annexation, which would enable it to have complete control of internal affairs. It is certain that wherever France has got a footing in South Africa, the most strenuous exertions will be made to increase its influence.

It is expected that Bayonne will shortly rival Bilbao as a port for the shipment of iron ore and other minerals. A line of railway has just been laid down from Bayonne to Saint-Etienne des Baigorry, which will allow of the opening up of the Banca Mines. This property lies to the south of the River Nive, and has an area of 11,600 square hectares. It is said to contain very rich deposits of iron and of argentiferous copper. The copper has been worked for some time past at the Banca foundry, where hydraulic power is used having a force of 200 h.p. The iron is found along the route followed by the railway, and at the place where preparations are being made for working the ore, the deposit has a thickness of 12 metres. There are two qualities of ore, one containing from 85 to 90 per cent. of carbonate of iron, and 1.20 to 1.50 per cent. of oxide of manganese, without a trace of sulphuric or phosphoric acid; and the other, hematites, containing 70 to 80 per cent. of peroxide of iron, and 1 to 2 per cent. of manganese, thus giving a content of iron of 50 to 61 per cent. The carbonated iron is said to be easily reduced, and is especially suitable for steel manufacture. The mine is estimated to contain about 12,000,000 tons of iron and argentiferous copper, and preparations are being made for an annual output of from 100,000 to 200,000 tons. It is contended that while the ore is equal, if not superior, to that of Bilbao, it can be sent from Bayonne at a much cheaper rate to England and other markets.

While the values of pig iron continue to be maintained at a very high figure, out of all proportion to the selling price of the finished product, an opportunity has been given for the introduction of a new element of competition. Not only has the arrival of small quantities of American puddling iron shown that it is possible for the metal to be sold profitably in Europe, but for some time past nearly the whole of the ferro-manganese consumed in Belgium and Germany has come from the United States. In the production of ferro-manganese a considerable quantity of fuel is used, and unless coals are cheap it cannot be produced at current prices at a profit. In Pennsylvania this combustible is so abundant that ferro-manganese can be delivered in Europe at a price which enables consumers to do without Spiegel iron and English pigs. It is reported that an understanding has been come to between the English and German blast furnace proprietors for the upholding of prices, and in this event American ferro-manganese will soon secure a firm hold upon the Continental market.

The statistics of foreign trade during the first four months of the year continue to be the most serious indictment that can be formulated against the present fiscal system. Every month shows an increase in imports, and a growing contraction of exports. The imports have improved from £50,372,800 during the first four months of 1893 to £63,655,600 in 1894, while the exports declined from £44,276,300 to £42,533,800. During April there was a decline of £120,000 in the imports of raw material, while the manufactured goods sent away were £2,300,000 less than in the corresponding month of 1893. The foreign trade in metallurgical goods is particularly unfavourable.

## OUR SOUTH AUSTRALIAN LETTER.

(FROM OUR OWN CORRESPONDENT.)

ADELAIDE, APRIL 11.

THE search for gold is being carried on with far more energy, and in a more thorough and systematic manner than has ever been the case in our colony. "It is an ill wind that blows nobody good," and while on the one hand the insane rush of thousands from all the eastern colonies to West Australia has taken away a considerable percentage of the population, the "unemployed" who could not find the means to get into the new El Dorado have had a certain amount of assistance subscribed here to give them a start at prospecting known auriferous districts in this colony. The state of the labour market has driven many men into the country, and resulting from these circumstances some rather important discoveries have been made. You have already been advised of the wonderfully rich find at Mount Pleasant, 35 miles east from Adelaide, where two men for nine days were literally digging out gold from a reef less than 3 feet wide, at the rate of £100 worth per day, and not hurting themselves by the hardness of the work. That and adjoining mines are continuing to yield very payable returns, and it is to be hoped that the proceeds of the gold raised, for the first few months at least, will be employed in the purchase of machinery or in other ways to aid in the proper development of the mines. The stone or "ore," as it is usually called—though gold ore is hardly a correct term—is to be treated by the cyanide process at the plant, which is being "run" by the Government Department of Mines. Other gold mines in the district, and which were abandoned many years ago, have been recently taken up, and are again being worked. New discoveries have been made in other localities, three of which are especially deserving of notice. The first is about six miles from the Alma and Victoria Gold Mine, Wankaringa, at a place called Lovely Gully, where a fine reef, traceable for miles, shows rich gold-bearing stone.

Several parties are working on their respective claims, and the results are considered very satisfactory.

The second locality is about 30 miles N.N.E. from the first named, and is on the Nillinghoo Run. Here a fine large auriferous reef, said to be from 12 to 19 feet in width, is being opened up, and numerous claims are pegged out along the course of the reef.

The third discovery is about 60 miles or more from the last mentioned, in a S.S.W. direction, and about midway between



the Nackara and Paratoo Railway Stations, on the Broken Hill line of railway. Having been engaged last week to inspect and report on this, I am able to give more definite information about it. The reef or lode has a strike as nearly as I could make out north-east, but the compass was considerably affected by the iron in the lode. The strike of nearly all the reefs in this part of the country is within about 10° of north-east. The cap of the reef consists of limestone varying from 1 to about 12 inches in thickness. Below this, and adhering to it, is manganic iron, often honeycombed and carrying visible gold. The country rock consists chiefly of argillaceous slate and sandstone, and the reef for the most part of manganic iron, with a small admixture of quartz, quartzite, and sandstone. The thickness of it at the depth of 8 or 10 feet between defined walls is from 2 to 4 feet; but at the surface in one place I measured the outcrop 25 feet wide, and beyond this spot two strong leaders were seen converging to the main reef. Several assays have been made of fair samples of the stone; the lowest yielded 2 ounces 4 dwts. of gold to the ton, and the highest over 12 ounces; other trials have given 6 ounces, 4 ounces, &c. My opinion is that when fairly developed the reef will yield an average of fully 2 ounces of standard gold to the ton of reef stone. The ground is easy to work, and timber is plentiful. Water is obtainable by sinking from 60 to 70 feet. This reef is the best I have seen in South Australia, excepting, perhaps, that at Mount Pleasant. It has been taken up for a length of about half a mile.

## THE SOUTH AUSTRALIAN PETROLEUM FIELDS, LIMITED.

### THE REPORT OF MR. GEORGE ADAMS.—PRESENT POSITION AND PROSPECTS.

WE are informed by circular that the reconstruction of this company has been most successfully carried through, and that ample working capital is now provided. The following is the report of Mr. George Adams who has examined the property:—

The property consists of two leases from the Secretary of State for India in Council for about six square miles of petroleum-producing land situated on the islands of "Ramri" and "Barangah," in the Bay of Bengal, on the coast of Burma, viz.:—

(A.) A lease of 4 square miles of oil land on the "Eastern Barangah" Island, for the exclusive production of petroleum, at a royalty of 5 per cent. of the gross yield; also a coal and mineral lease over the same area for a similar term at a royalty of 4 annas per ton.

(B.) A lease of 2 square miles of oil land at "Minbyn," in the northern part of the Island of "Ramri," for the exclusive production of petroleum over that area at a similar royalty.

(C.) A complete and extensive set of oil boring machinery of the best make and latest type, purchased in 1889, now lying at Alfred's Flat, near Adelaide, South Australia.

Previous to the purchase by this company, these concessions were developed by the Barangah Oil Company (Limited), who expended a very large capital in steam boring machinery, putting up a complete refinery and case making plant, barrelling house, engines, boilers, dwelling houses, magazines, pipe lines, pumps, a saw mill, providing facilities for shipping, and all the necessary appliances for producing and dealing with the oil, all of which are acquired by this company. Since the purchase by the late company in 1891 the property has been under the charge of Mr. J. W. Crosbie, of Petrolia, Ontario, who, up to the present date, without any working capital or assistance of any kind from the directors here, has carried on the development, paid off all the local indebtedness, and has accumulated a good stock of oil.

The oil produced is of very excellent quality and has been favourably reported on by Mr. Boverton Redwood; it is very easily worked, and found to contain over 60 per cent. of burning oil and a very small percentage of loss; some part of the production is saleable locally without any refining. The large percentage of burning oil contained in the crude is a special feature of this part of Burma, the produce of the "Genang" "Young" district giving a much smaller proportion.

In rightly estimating the value of this property it will be well to consider, first, the very favourable terms of the leases, compared with those now being granted by the Indian Government, which are the limit of each grant to one square mile, on which an annual fixed rent of Rupees 1163-10 is charged, and a royalty of 8 annas per 40 gallons, and very much more onerous terms as to the exploitation; at this rent the fixed charge of the South Australian Company would amount to Rupees 6981-12 per annum, which under the leases before mentioned is entirely saved. Secondly, the extremely favourable situation on the seaboard, affording the greatest facilities for rapid and inexpensive shipments to all the local markets; thirdly, the protection to the home product by the duty of 8½ annas per case levied by the Government on ore imported into India; again, the low cost of working by the use of native labour, the number of Europeans being minimised, and finally, the high price realised by the product over Rupees 2 per maund. Taking all these circumstances into consideration, in my opinion, this property, which at the present moment is self-supporting, will, with the capital to be provided by the scheme of reconstruction, proper management and systematic working, produce sufficient oil to pay a very good dividend on the capital.

Shipments of refined petroleum from the United States to India.

In 1893 ..... 5,943,534 cases, equal to 1,118,707 barrels.

Shipments of petroleum from Batoum to India, China, and Japan.

In 1890 ..... 10,965,000 poods, equal to 1,096,500 barrels.

" 1891 ..... 13,425,000 " " 1,342,500 "

" 1893 ..... 18,423,000 " " 1,842,300 "

THE BALLARAT SCHOOL OF MINERS.—We have this week received a copy of the calendar for 1894, from which we extract the following particulars:—"The average number of students in attendance at the school classes for the whole year was 471. Courses of elementary science, lectures on chemistry, and electricity and magnetism were delivered weekly at eight of the principal State schools. Ninety-two examinations in various subjects have been held during the session, 16 being final for competency examinations, 74 stage or grade examinations, and two elementary science State school pupils' classes. Of 73 candidates who presented at the final examinations, 53 passed; at first and second stage examinations 422 students presented and 288 passed. At the semi-annual examinations of the State school science classes, 171 pupils presented and 85 passed. Sixteen students from other colonies have been attending the school classes during the past year. The income of the school from all sources other than Government subsidy amounted to £2490 12s. 6d., made up as follows:—Fees received from students, £1003 14s. 3d.; work performed for the public, £1156 1s. 8d.; public subscriptions, £144 17s. 6d.; and sundries, £207 0s. 1d. The work done for the public comprises 1767 assays and analyses (including 1261 ballion assays); 178 parcels of ore, weighing 259 tons 17 cwt., treated in the mining laboratories; 588 mineralogical and other specimens determined and reported on by the curator; 64 gauges tested, and 120 parcels of bullion in various quantities smelted and refined for banks, miners, and others.

FATAL ACCIDENT AT A STEEL WORKS.—At Hunslet Steel Works, Leeds, on Wednesday afternoon, a slag heap, weighing about 15 tons, fell upon a number of labourers, who were employed in filling trucks. A rescue party was formed, and it was found that one man, George Booth, aged 30, who only commenced work on Tuesday, had been killed, and several injured. No other fatal result is apprehended. This is the third accident of a similar character at these works.

## THE SAMPLING OF ORES AND TAILINGS.\*

By THOMAS CLARKSON.

ONE of the most frequent operations with which the metallurgist or mining engineer is concerned is the assaying or analysis of raw material and products. Great importance is necessarily attached to this operation, supplying as it does the quantitative basis upon which has to rest all calculations relative to the determination of values, or relative to the question of economical treatment, the amount of loss, the degree of fineness, &c. Assaying is something of an art, but is a good deal of a science, having attained to a very high degree of precision, and necessitating the use of the most delicate and sensitive instruments for the measurement of weights that can be devised or constructed by the refined mechanic. The saying that "a science advances only in proportion to its power of accurate measurement," is now so familiar as to have become almost a platitude. It is not easy to imagine what was the condition of the science of metallurgy, if science it could then be called, when assaying was scarcely known, or but little practised. It is clear that intelligent work would be as unlikely as for a man to safely traverse a dangerous pathway by night without the aid of a lamp. Under such circumstances success could be had only by sheer luck. Yet, even since the art of assaying has supplied "a lamp above ground" to the miner, it has happened, and not very long ago, that a deposit which was worked unsuccessfully for copper was proved by other workers to be a gold mine. If a proper analysis had been made, such a mistake would not have been possible. This case is probably not very exceptional as an illustration of the insufficient practice of assaying.

We are now led to ask, What are the reasons for this

### Insufficient Practice of Assaying?

There are probably several reasons for this; one is undoubtedly the lack of appreciation of scientific methods of work, which is doubtless owing to deficient technical training. Perhaps another reason may be that some managers love darkness rather than light, because they fear that the process they are working is not quite so efficient as they would like to believe; and if the search light of the assay were focussed upon all their products, it might reveal an unwelcome condition of things. Perhaps this reason is exceptional. Another reason is that the preliminary operations to assaying have not yet been brought to such a degree of perfection as in every case to place the assayer's report above doubt and suspicion. For example, it may be stated in a prospectus that the assay of a portion of quartz from a certain mine is 1000 ounces of gold to the ton, and this may be certified to by one of the distinguished members of this institution, whose name would be, of course, quite sufficient guarantee for a *bona fide* assay. Yet this report is generally of no practical use as an indication of the value of the property, simply because there is no guarantee that the portion of quartz is an average of what there is in the mine; in other words, the portion is not representative, and cannot, therefore, be truly labelled a "sample."

This introduces the

### General Question of Sampling.

and we are led to consider how a true sample can be obtained from either a lode, a heap of ore, a stream of tailings, a pile of matte, or other material.

I do not propose now to deal with the theory of the selection of a sample, this having been recently discussed elsewhere, but rather to invite attention to an improved practice, which will probably be of greater interest to an institution of practical men. The details of the best methods of obtaining a true sample will vary somewhat with circumstances, but the principle of the method is equally applicable to all. The method hitherto adopted has been one of hand selection combined with laborious hand mixing. This is a sufficient explanation of variations and errors, for the human machine is, as everyone knows, peculiarly subject to variations, and to the influence of external forces which may be either conscious or unconscious. There is no reason why hand selection should not be abolished for most sampling purposes; in fact, with one or two exceptions, there appears to be every reason why it should be altogether abolished, when the work can be done by machine with uniform accuracy, and with less than a tenth of the former expenditure of time and money.

### Sampling by Machine

is not a new idea in America, although it is a novel practice upon this side of the Atlantic. With that mechanical spirit, which is so characteristic of them, the Americans have designed several machines for sampling, which have been used for some time, and although not free from defects, they have proved a great advance upon hand work as to general convenience, rapidity, and efficiency.

In the machine before you, the defects of former machines have been eliminated. It has been tested by American mining engineers, even by some who are interested in the construction of other samplers, and the unanimous conclusion has been that this machine is a great advance upon anything they had, and that its operation is practically perfect. As to this, the machine will presently speak for itself by a practical demonstration, and in a far more eloquent manner than I could possibly attempt. Some of the members of the institution are familiar with the machine, but in order that the practical tests may be intelligible to all, it is desirable to explain the general construction and action of the machine, as well as the nature of the proposed trials.

Going to the first elements of machine sampling, suppose that we have a fixed hopper delivering a stream of ore. This stream may be divided by a vertical plate into two parts, but as the contents of the hopper may be richer upon one side than on the other, we cannot be certain that the two parts into which the stream is divided are of the same value and composition. Something more is necessary to ensure this identity of composition. This something is supplied by giving the hopper a rotary motion, so that however variable may be the value of the ore in different parts of the hopper, each part comes in turn over each side of the dividing plate. If the edge of the plate passes exactly through the centre of the rotating stream of ore, then we may be confident that the two portions of ore are of the same composition, and further, they should be of practically the same weight. Each of them would be

### A 50 per cent. Sample.

but this is much too large for ordinary purposes, therefore something else is necessary which will enable a smaller percentage to be taken without unnecessary repetitions. Your attention is now asked to a little elementary plane geometry. If we make a drawing of a section of the rotary stream it would clearly be a circle, and the edge of the dividing plate would appear as a diameter of the circle. Every circle contains, according to current geometrical notation, 360°, and a diameter divides a circle into two portions each of 180°. Two diameters at right angles divide the circle into four segments, each of 90°, and similarly five diameters equally spaced split up the circle into 10 segments, each of 36°.

Now consider what would happen if a rotary stream of ore were divided by a number of plates arranged radially from the centre of the stream, so as to make angles of 36° with one another, it is clear that the stream would be divided into 10 parts that were identical both in quality and in weight, any one of which could, therefore, be taken as a true sample of the bulk. But now a practical difficulty arises, as

### Practical Difficulties.

unfortunately, have a habit of doing, to interfere with the even tenor of our theoretical considerations. Ordinary materials that have to be sampled are in a more or less lumpy condition. It would be noticed that the inner end of a segment of 36° is very narrow, and would not permit a large piece of material to pass; and as a sampling machine, to be useful, must be able to deal with coarse lumps as well as with fine material, some means must be found of overcoming this difficulty. What is required is a wider segment, and this, too, without increasing its angle. The obvious solution is to make the material spread out to a large diameter—in other words, instead of a solid stream to use a hollow one, which can be expanded to operate upon any required width of segment. This spreading out is easily effected by placing a cone, so that its point splits centrally the solid rotary stream as it is delivered by the hopper. We have now collected from first principles all the elements of

### A Perfect Sampling Machine.

and all that is necessary is to design an apparatus which will embody all these elements. Such a machine is the one before you. It is provided with a large storage hopper above the rotary hopper, and also with an arrangement by which the cutting segments can be rapidly changed from 36° to 18°, or vice versa, so as to take either 10 per cent. or 5 per cent. samples. Care has been taken to prevent the retention of any material in the machine, by giving all the surfaces over which the ore passes a steep inclination, and by excluding all flat ledges. This is, perhaps, all that need be stated in order to make the general construction and operation of the machine clear.

Having designed a machine according to a geometrical principle, it is interesting to all engineers to know how the practical results correspond to the theory when the machine is put to the test. As to this, the machine will now speak for itself. We will subject it to one of the most severe trials that could be applied to a sampling machine, and the precision of the work will be tested by making

### A Mechanical Analysis

of the samples obtained before you. The material I propose to use is a mixture of three substances of different size, shape, and specific gravity. We will first weigh each one singly before combining them, so that we may know the exact composition of the mixture. Then, without any preliminary attempt to mix the three materials, the bulk will be passed through the machine, and two samples will be taken, each of 10 per cent. Their weights will be compared with one another, and with 10 per cent. of the bulk. Each of the samples will be then separated into its constituents by sifting, and the percentage of each constituent ascertained by weighing, and compared with the percentage of each constituent in the bulk.

### Description of the Experiments.

[The author then proceeded to illustrate his remarks by experiment.]

The three materials which had been selected for the mixture were wheat, peas, and sand—for the two reasons that such materials are practically unmixable, and, therefore, most difficult to sample in the ordinary way; but although difficult to sample such a mixture, it is very easy to test the accuracy of the sampling by sifting out and weighing the constituents. A mixture was then prepared by weighing out—

12.5 lbs. of wheat  
7.5 " " peas  
5.0 " " sand

25.0

As each lot was weighed it was thrown into the hopper of the machine, the result being that the materials were in a more or less stratified form, or, in other words, they were as badly mixed as was possible. When the three lots were weighed out the machine was turned, and the material allowed to fall into it by drawing out a slide. In a few seconds the work was done, and two samples were obtained which each weighed 2.5 lbs., or 10 per cent. of the bulk, thus proving the precision of the machine in taking portions of definite percentage. Then to prove that the portions were true samples, one of them was sifted so as to separate the three constituents. These were then weighed, and gave the following results:—

1.25 lbs. of wheat  
.75 " " peas  
.50 " " sand

2.50

Which proved that the sample was exactly the same analysis as the bulk. The weighings were checked by Mr. Moreing, and as the results of the tests of the first sample were regarded as so conclusive, the President thought it was unnecessary to test the other sample.

Another experiment consisted in sampling a ½ cwt. bag of silver ore, crushed to ½ inch mesh. The bag was emptied into the hopper of the machine, and was then held underneath to receive the ore as it passed through. In 48 seconds the sampling was completed, and the samples each proved to weigh slightly under 5 lbs. 10 ounces, which exactly corresponded with 10 per cent. of the ½ cwt.

An illustration was then given on a small scale of an easy arrangement of sampling a number of trucks full of ore. The trucks were brought and tipped into a bin, the mouth of which was level with the floor. Beneath this bin the sampling machine rested upon a staging, and beneath this staging were a number of empty trucks for receiving the sampled ore. On releasing a plug at the base of the bin, the ore descended into the sampler which took two samples of 5 per cent., and the rest of the ore then fell into one of the empty trucks beneath.

The last demonstration was with the laboratory dividing machine, which was used to split up a sample into six equal and exactly similar parts. This operation was successfully completed in less than six seconds.]

The author, continuing his paper, remarked that a small size machine weighing about 7 lbs. has been made of aluminium. This may be found very useful for prospecting purposes. Of course, the prospector, in cutting down his kit to the lowest possible weight, is more particularly concerned about what he can dispense with, rather than what he can do with. And the best man in any emergency will always be the one who can accomplish the most with the fewest number of appliances; but all the same, the superior accuracy and precision of machinery will always tell in favour of its adoption.

The operation of the machine is not confined to any particular class of materials. Without any alteration, it may deal with solids of various sizes from, say, 6 inches down to 4, and with but slight modification the machine will operate with equal efficiency upon liquids and pulp. This brings to notice a very important matter—viz., the

\* Paper read before the Institution of Mining and Metallurgy on Wednesday last.



### Reliable Sampling of Tailings

from a gold stamp mill, to ascertain the amount of loss of gold, and the value of the tailings, with a view to their subsequent treatment or disposal. To obtain trustworthy indications by hand needs very regular attendance at stated intervals, say every hour, for the purpose of taking a portion from the stream. It is important that an equal portion be taken each time, and when it is also remembered that the value of the tails at different points across the stream may vary, the difficulties are seen to be considerable. The difficulty of properly sampling tailings was pointed out to the author by one of the members of this institution, and a machine has been made upon exactly the same principle as the one shown for solids, but with necessary modifications of detail. It is found that the principle of a rotating annular stream applies very well to a mixture of solid and liquid such as battery pulp, and as the solid is all finely crushed, it is possible to take a sample of only 1 per cent. at one operation. The tailings from five head of stamps can be easily passed through one sampler as they flow away; a true sample is retained and the bulk passes on.

Suppose that in 24 hours the five stamps crushed 25,000 lbs., or about 11 tons, and that 10,000 gallons of water are used, a 1 per cent. sample of this would consist of 250 lbs. of quartz and 100 gallons of water. Now, this would be too large a sample to deal with, so it is reduced by taking a 1 per cent. of it on a smaller sampler, forming really a part of the other one, so that the operation would go on continuously without any intermediate handling. As the net result of the day's work, we should have 2½ lbs. of quartz in a gallon of water, quite

### A Manageable Quantity,

which could be collected in a locked vessel if necessary. As representing this sample, I have a gallon of water in a vessel, and 2½ lbs. of dried tailings in a sealed bottle, which can be labelled and kept for future examination. In this way an automatic daily record of the value of the tailings could be kept, somewhat corresponding to our daily barometer charts, and as the personal element does not come into the sample, every confidence could be placed in the accuracy of the result.

The adoption of such an automatic arrangement of sampling would throw full light upon the condition of things at the tail end of the battery, enabling the exact value of the tails to be ascertained, and if a proper system were adopted for sampling the ore before it was fed into the stamps, the information would be very complete, and a trustworthy check would be furnished to the efficient working of the battery.

The machines are being used for sampling the sawings of silver lead bullion, both in this country and on the Continent, with

### Most Satisfactory Results.

The sampling is done in less than a tenth of the old time, and this too with one man's attention instead of four. The machines are also employed by some of the largest smelters in South Wales for sampling various ores. These are some of the present applications of the machine for mining and metallurgical purposes. The sampling of a lode is one of the few exceptions where hand selection is indispensable. If it was possible to put the whole of a lode through the machine, I would recommend it to be done, but failing this a large sample—and the larger the better—should be carefully selected by hand, then crushed and passed through the machine. Speaking generally, this system can be applied to all materials that will run or that can be made to run from a hopper, whether solid or liquid. The above examples are cited as indicating rather than exhausting the usefulness of the machine. Before bringing this somewhat rambling paper to an end, I would like to refer to the President's admirable address, in which reference was made to the great progress which has been achieved in the metallurgical industries of America, and to the increasing keenness of the competition between the Old and the New World.

Permit me, in conclusion, to emphasise one reason for this state of things. In America

### The Mechanical Spirit

is strong and vigorous—that is, the spirit which prompts the adaptation and adoption of machinery wherever possible in the place of hand labour, and the attitude of Americans towards the investigation and adoption of new departures and improvements is generally described by the expression, "Why shouldn't we?" whereas with us the general attitude is, "Why should we?" why should we, until compelled, revise our methods, and disturb a condition of things which has been as it is for so many years? It is thus about sampling. The present methods are the outcome of many years of practice, and they embody the results of many disputes between buyers and sellers. It is, therefore, only natural that there should be hesitation in abandoning the old way in favour of a new one. But when it can be conclusively shown that there is a much better and cheaper way, further delay in the adoption of the superior system can only be accounted for by prejudice. However, as prejudice is an expensive indulgence, sooner or later the pocket is touched, and then prejudice yields before the irresistible advance of true practical science.

### The Discussion.

Mr. MORRIS was sure the members would be very pleased to have had so full a description of Mr. Clarkson's sampling machine. So far as he was aware, none so perfect had ever, up to the present time, been brought under the notice of mining engineers, though for some time there had been sampling machines in use in America. The results of the experiments carried out during the evening, upon the various mixtures, had been simply startling. Indeed, the advantages attaching to the use of the machine were so patent that he could not help thinking that in the future no gold mill could be considered to be complete without it. One of the most essential features in treating gold ores by milling was certainly to have correct samples of the ore as it went into the mill, and similarly correct samples of the tailings as they came away; so that it might be clearly seen what part of the contents was being saved, and where the loss, if any, was taking place. The attainment of this end up to the present had been an exceedingly laborious task. Samples had been taken in any but scientific methods. Though so many of them had given the greatest attention to the matter they had all been baffled by the difficulty of getting men, where there was no supervision, to take correct samples. Moreover, most mill men were not particularly desirous of having good samples of the tailings. In fact, they took care not to have them. With one of Mr. Clarkson's machines they would have an absolute and complete check upon the men, and he expected to see them largely adopted, notwithstanding the remarks the author had made as to the difficulty of overcoming prejudices against new methods. Mr. Clarkson might confidently anticipate the opposition of mill men to his machine, but with the support of the mining engineers belonging to the institution he would probably have his own way, though in the early days the machines would probably go wrong. He had been particularly struck with the small machine exhibited by Mr. Clarkson, which was made of aluminium, and weighed next to nothing, while it could deal easily with astonishingly large quantities of material. For a considerable number of years he, personally, had encountered many difficulties in sampling mines. Taking the samples in the mines was a

pretty difficult business when the vein of quartz was a hard one. But, having got the samples, breaking it down and quartering it up was at once the most laborious and unsatisfactory of operations possible, for it was a most difficult matter to get an accurate sample of the sample taken in the mine. Days and days he had spent in Mexico, Africa, and other warm countries, pounding up stone, and then crawling about upon hands and knees on a sheet dividing the stuff up, and trying to get accurate samples. These vivid recollections in mind he could not help thinking when he looked at the machine that it would have added some years to his life. (Laughter.) It would certainly be a great boon to inspecting engineers to have some small machine like that with them. If ever he went in for inspecting work again—and he sincerely hoped he never should—he should certainly use one of the machines himself. To the prospector he hardly thought they would be of much value, for he was not a man who went in for scientific sorting. Of course, beyond gold mining and mine inspection, there would be considerable use for the machines in sampling the various kinds of ores that were sold by sample—such as manganese ores and silver-lead ores. At the present time he was connected with large operations in the way of manganese, the whole of which was sold by sample, and great trouble they had with the samples. So laborious, in fact, was the operation of sampling, that the buyers generally kept the last sample before them, and were usually content to take them, instead of going to the trouble of sampling every wagon. The machine, he was sure, would save a great deal of money—he hardly knew whether to buyer or seller, but probably to the former. In any case it was much better to be correct. (Applause.)

Mr. W. CROWDER thought the apparatus might probably suit the consumers of phosphate. There was sometimes a good deal of trouble in getting fair samples of some of the lower qualities of Canadian and Florida phosphates, and this sometimes occasioned disputes which would be settled by the use of this machine. The apparatus would be especially useful in sampling ores which contained a good deal of quartz, and in cases where sampling by the ordinary methods was a very difficult matter. The machine seemed to have the desirable effect of giving good samples even where the material was coarse.

Mr. McKILLOR had had much experience in sampling, and he wished to tender his thanks to Mr. Clarkson for having, as it seemed to him, made easier a most difficult work. Some four years ago he had devised, with the assistance of a Chinese tinsmith, a machine which acted in something the same way. He had not had sufficient ingenuity to give a rotary motion to the machine, and consequently it was not quite so satisfactory a production as Mr. Clarkson's appeared to be. The greatest difficulty was that the stuff had to be reduced to a certain size before accurate results could be obtained. Until the stuff was so reduced to size there were considerable variations in the samples. Another difficulty was occasioned by the fact that most of the ores reached the works damp and the machine became clogged, thus necessitating recourse to the undesirable practice of drying them. He should very much like to see Mr. Clarkson's machine adopted by the tin people down in Cornwall. Were the slimes and pulp leaving the batteries passed through such a machine, as well as the tailings, he thought it would go a long way towards obviating the frightful waste that went on there. Having made enquiries there, he found that one-sixth, approximately, of tin put out in Cornwall was taken away by the stream and lost to the shareholders. Tin mining in England was now in quite a sufficiently sick state to warrant the introduction of some such check.

Mr. RICKARD thought the Cornishman would be extremely obliged to the last speaker for his commiseration, but unless he were mistaken Mr. McKillop had not informed himself as to how sampling was done in Cornwall, and that was precisely the complaint he had to make against the paper. Instead of being a paper on sampling, it really gave a lot of padding about things which might advantageously have been altogether left out. In one place the author brought up the old matter of gold being found in copper, and about mica and pyrites being taken for gold. Those were the things he used to hear about in his childhood, and had long since supposed to have been relegated to oblivion. Personally, he did not think the Cornishman was so far behind the age in his sampling. He believed there was no operation connected with mining anywhere which reflected more credit upon the miner than the manner in which he dealt with large parcels of copper ore in Cornwall. In treating of this very important matter of sampling, he thought Mr. Clarkson went into a great many things, by way of introduction, which were hardly covered by the subject. In fact the paper did not in reality touch sampling. The machine was simply a mixer. There was, however, the smaller machine, which was a very remarkable apparatus, and one which would be of great service. As to the mixer, however, admirably as it was constructed, and lucidly as it had been explained, it certainly left the whole question still unsettled. Were they to accompany him to Cornwall and see how they proceeded there in dealing with the rock matter which came out of the shafts, and how it was disposed of before it went to the ore buyer, they would acknowledge that the new machine would hardly affect the whole operation. It seemed to him—they were there for the purpose of being critical—that the paper too much exalted the mechanical arrangements adopted in America. So far as he knew, the engineers of this country were quite as much alive to the necessity of adopting mechanical and automatic arrangements as they in America. Perhaps the author had not given himself the same trouble to find out what was being done in England as what had been done in America. As to the prospector, the machine would obviously be of no use to him. He would never put one into his kit. There was a good deal of interest attaching to the question how the machine was applied in taking a sample of effluent tailings. Perhaps Mr. Clarkson would explain whether there was any intervention of hand labour in the operation, or whether it was carried out under lock and key so that it could not be meddled with. (Laughter.) Having said so much in criticism of the author's paper, he would add that his excellent machine would get plenty of commendation, and he should regret it if he were not as forward as anyone in adding his word of praise and satisfaction at the manner in which Mr. Clarkson has overcome the difficulties incidental to the production of an effective mixer—such as he held the machine to be.

Mr. McTIER was not inclined to agree with Mr. Rickard in his criticisms of the machine. He could not, himself, see how any machine could be a sampler without being a mixer. (Hear, hear.) Machines something similar in construction had been in use in America, and they were found to work apparently very well; but there was always the difficulty of the stream going down between the two openings of the cone, and therefore they did not get an absolutely accurate sample. With a machine, like Mr. Clarkson's, having a rotary movement, the results would, no doubt, have been much more satisfactory. No mechanical contrivance, however, could possibly get over the difficulty of a lack of conscientiousness on the part of the men. At present the work had to be placed in the hands of ordinary workmen, and no manager could possibly be on the spot all day to see the samples taken. If, however, the whole wagon load could be put through a machine like Mr. Clarkson's and parts taken out, then the risk of incorrectness and consequent loss would be

very much reduced. They were greatly indebted to the author for demonstrating by experiments the value of his machine, and while the apparatus was certainly not going to do everything in the way of preventing loss from gold milling, still, if properly applied, there was no doubt it would be of immense advantage to most in the profession.

Mr. J. H. COLLINS did not think they could listen to a description of the machine, or see the remarkable experiments conducted without seeing that it was a fair mixer and most perfect divider—much more perfect, in fact, in its results than any which could be obtained by the conscious work of any persons. At Rio Tinto 14 years ago, they had a very large amount of sampling done, and such a machine as the one before them would have been most valuable. Had there been such a thing in existence he was sure that one of his first requests home would have been for one or more of every size of the machine from the smallest to the largest. Mr. McKillop had suggested that there was a good use for the machines down in Cornwall. He ventured to think that when we knew Cornwall better he would admit that he had not suggested quite the best field for the machines, and that the fact that one-sixth of the tin raised from the mines in Cornwall went down the rivers and was afterwards recovered from them was no evidence of bad work at the mines. The one-sixth afterwards recovered, like the five-sixths originally recovered, cost in the first instance very nearly as much to get as it was worth—a fact which was not to be overlooked. If the one-sixth were subsequently got for nothing there would be room for commiserating with the shareholders. He should like those who had a bad opinion of Cornish work to give some closer consideration to the subject. He could take them to one place in Cornwall where, during the whole of last year, and at the present time, tin ore was being quarried and trammed, and crushed and dressed for less than 1s. a ton all told. If there were any place in the world where such work was done at a cheaper rate he should be glad to know of it.

Mr. HANNAY spoke a few words in commendation of the invention, and said that, though no machine could bring honesty into a man, there were many other purposes for which the one before the meeting would be very useful.

Mr. McKILLOR explained that his remarks had been directed not towards the sampling of stuff when it came out of the mine, but to the sampling of pulp as it came from the stamper. His conversations with mine captains in Cornwall with reference to the subject had always ended in the waste being attributed by each captain to any mine but his own. (Laughter.)

Mr. CLAUDET wished to have the character of the machine clearly defined. Personally he should say it was essentially only a divider or sampler, and not a mixer.

Mr. CHARLETON fancied that a good deal hinged upon the last point. So far as he knew there were two sampling machines, one in which the whole stream was taken part of the time, and the other, which took part of the stream, the whole time. It was important to determine to which of these two classes Mr. Clarkson's machine belonged; for he had heard it stated by American mining engineers that, so far as their experience went, the best results had been obtained by machines which took the whole material part of the time. The objection against the machines which took part of the stream the whole time was that unless the ore were perfectly dry, or if it contained pieces of chip or rag, the work was not always as satisfactory as it would be when the ore was of even grade. In his opinion the great use of mechanical samplers was in works where the ore was sent to a third party to be sampled for buyer and seller, whose returns were taken as the basis on which to determine the value of the sample, and come to an agreement as to the price. As far as the accuracy of the sampling itself went, he believed that just as good results were obtained with hand sampling, provided it were carried out on a proper system, as with the machine. Mr. Charleton concluded by describing a method of sampling in which a shovel, divided into four compartments, was used.

THE CHAIRMAN said there was no question that the greatest progress in modern method had been due to systematising, and anything which could help in that direction was a distinct gain. In order to systematise properly there must be simplicity, and one of the greatest charms about Mr. Clarkson's machine was its extreme simplicity. Most apparatuses, when first introduced, were extremely complicated, and it was only as time went on that they became simplified. Mr. Clarkson's machine, however, appeared to be extremely simple at the present time. There were two points upon which he could wish to have some further information. The first was as to the size of the material introduced, for it seemed to him that the question of size must necessarily enter largely into the matter. Secondly, there was the question of the moisture of the material. No doubt the rotary movement of the machine would enable it to pass what would otherwise be impassable.

Mr. CLARKSON, in replying to his critics, did not anticipate much difficulty in meeting their objection, but thought he had every reason to thank the meeting for the kind reception they had given to his machine. There was necessarily a great deal which, in describing such a machine, had to be left unsaid. One or two papers had already published descriptions of the machine, and whatever had been made public in that way he had endeavoured to eliminate from his remarks. Some misapprehension appeared to exist as to the nature of the machine. It had been declared by Mr. Rickard and one or two other gentlemen that a machine, in order to be an efficient sampler, must necessarily be also a mixer. Such seemed at first sight to be the case, but really it was not so. His own machine was not a mixer, as it had been so emphatically declared to be. It was perfectly immaterial whether the stuff fed into the machine had been previously mixed or not. Thorough mixing was, of course, a *sine qua non* in hand sampling; but he did not require any mixing with his machine. Whether the first part was fine, coarse, or intermediate did not matter, because the machine took the same definite percentage of whatever kind of material happened to be delivered by the hopper at any instant, and clearly the machine did not act as a mixer, for if all the rich material was at the bottom of the hopper it would rush through first and not mix with the rest. He was not qualified by experience to speak of the systems in vogue in Cornwall. All his machine would do was to point out where the loss was taking place. It would reveal the quality of the stuff going into the stamps, and what was going out as tails. It did nothing more than this, but to know one's enemy was half the battle. Mr. Rickard's remarks had not surprised him. He should, in fact, have been a good deal surprised had Mr. Rickard said anything different—(laughter)—having had the pleasure of listening to his criticisms upon several papers. Most people would agree that the Americans were certainly ahead of us in mechanical contrivance. This was so extremely patent to anybody who went over there and saw the ingenuity with which mechanical means were adapted to the wants of every day life. The Americans had, of course, had many advantages over us. They started where we left off, and they had no old prejudices to overcome, such as were so strong upon this side. Still, though they had been using sampling machines for some time, one or two of which had been mentioned during the discussion, these were not so perfect as they might be. The author then proceeded to describe the Brunton and Bridge-



## REVIEWS.

## ENGINEERING CHEMISTRY.

*Engineering Chemistry.* By H. J. Phillips, F.I.C., F.C.S. (London: Crosby Lockwood and Son). Second Edition.

The second edition of Mr. Phillips' work follows close upon the footsteps of the first—published in 1891—and is presented to the public, enlarged by 80 pages, and embodying the suggestions made by the critics of the first edition. The object of the work is to give precise methods of analysing and valuing the most important materials in general use by engineers; and we may at once say that this object has been fully realised, and that the work is one which will be welcomed by all connected with the great industries of the world.

After an introductory chapter explaining Reddrop's system of reagents, which is adopted in the various analytical processes described in the book, the author proceeds to describe the manufacture of iron and steel, and the various methods used for their analysis. In this connection the combination of iron and carbon is of great interest, and especially whether the carbon is present in actual combination as carbide of iron, or uncombined in the form of graphite, as the property of the metal is totally different even with the same proportion of carbon, unless it be present in the same form. Up to a certain point the proportion of carbon decreases the ductility and increases the tenacity of iron, while in steel it plays the most important function of tempering, which depends upon the amount of carbon present, and the rate of cooling. With this property of steel, the ordinary mining blacksmith is well acquainted, but although he knows the exact colour at which to cool off, he is usually ignorant of the reasons which govern the process. These are fully gone into, and the influence of carbon on iron and steel, and the methods of its determination, are fully described.

We are all so familiar with the terms "cast iron," "wrought iron," and "steel," that it seems almost a sacrilege to suggest any other classification of these materials. Science, however, demands a more accurate description, and so we will quote that decided upon at an International Commission in Philadelphia in 1878, based upon the proportion and condition of carbon in the metal, as follows:—1. Pig iron with 2.3 per cent. and more of carbon, melts at a comparatively low temperature (1075° to 1275° C), and cannot be forged. (a) White pig iron; all the carbon is combined with the iron; the compound is very hard, brittle, white, and is made solely for the purpose of being converted into malleable iron. (b) Grey pig iron; in which more or less of the carbon is present in the form of graphite. The metal is soft, tough grey to black, and is used for conversion into malleable iron and steel, or for the production of castings.—2. Steel with 1.6 to 0.4 per cent. of carbon melts at 1400° C. By sudden cooling of a red-hot mass the hardness is much increased.—3. Wrought iron with less than 0.4 per cent. of carbon melts at 1400° C and above. It cannot be appreciably hardened.

The Commission further decided that:—1. Every malleable compound of iron, containing the ordinary elements of that metal, which is obtained either by the union of the pasty masses of iron, or by any process not involving fusion, and which cannot be hardened by the ordinary method, shall be called "weld iron." This is what was formerly known as wrought iron.—2. Any analogous compound, which by any cause hardens, shall be called "weld steel." This is what has hitherto been termed puddled steel.—3. Every malleable compound of iron, containing the ordinary constituents of that metal, which is obtained and produced in the fused state, but which does not harden by ordinary methods, shall be known as "ingot iron."—4. Every compound similar to the last, but capable of hardening from any cause whatever, shall be called "ingot steel."

We have noticed this chapter on iron and steel fully because these metals are so largely used either for constructive purposes or as tools by the mining man, and it is of great importance to him that he should be well acquainted with their various qualities and the reason why they differ, though in all probability he will never be called upon to carry out any analysis of these metals, the various methods of which are next described by the author. Passing on now to copper, we find first of all a short description of the various ores of that metal, and then the process for the complete analysis of the metal itself. Mr. Phillips does not give, as far as we have observed, any of the ways for the estimation of copper or any other metal in the ore itself, with the exception of those of iron, but takes the metal as it leaves the smelter, and then proceeds to point out the various impurities which may be present and the method of their determination. These consist largely of traces of all the other metals except tin and zinc, although when the average amount of metallic copper is over 98 per cent., it can well be imagined that the traces of the seven other metals present are but small.

Those of our readers who have spent their lives in a vain attempt to stop the loss of lead in the tailings from their mills will smile, perhaps, at the observation of the author when treating of lead, to the effect that the concentration of lead ores is "easily performed (owing to their high specific gravity) by mechanical means." The word "easily" seems to us to convey a wrong impression, and after a very long experience of the process in question, we can distinctly say that it is misapplied in this connection. However, we must remember that the author is a chemist of some distinction in his profession, and not a mining man; and although we wish that the work could have been so extended as to embrace mining practice, we certainly have nothing but praise to give it from the point of view of a metallurgist or constructive engineer.

After noticing the characteristics, and describing the analyses of lead, zinc, tin, ferro-manganese, ferro-aluminium, brass, bronze, and the various alloys used for the manufacture of bearings, the author passes on to fuels—solid, liquid, and gaseous, and then to water. These are followed in Part V. by a section dealing with lubricating, illuminating, and special oils, after which the book is brought to a conclusion with chapters relating to gasworks' products and explosives. The work appeals especially to students of chemistry and engineering, as well as to practical engineers, and fulfils its purpose of giving precise methods for analysing and valuing the most important materials in general use in engineering and its allied professions.

## PUBLICATIONS RECEIVED.

In sending books for review publishers should state their price.

"An Introduction to the Study of Metallurgy." By W. C. Roberts-Austen, C.B., F.R.S. Third edition. London: Charles Griffin and Co., Exeter-street, Strand.

"The Metallurgy of Gold." By T. Kirke Rose, B.Sc. London: Charles Griffin and Co.

"Assaying." By C. H. Aron. Parts I. II. and III. San Francisco: The Dewey Publishing Company.

"Johnston's Elements of Agricultural Chemistry." By C. M. Aikman, M.A., B.Sc., F.I.C. Seventeenth edition. London and Edinburgh: William Blackwood and Sons.

"The Popular Handbook of Finance." By A. Baicea, M.I.J. London: Saxon and Co., Bow-church-street, E.C.

Journal of the Society of Arts.

machines, pointing out the comparative defects and advantages of the two machines, giving the preference to the Bridgman as more efficient and more accurate; though the initial cost and complicated mechanism left something to be desired. Proceeding, Mr. Clarkson pointed out that the machine exhibited was so made as to permit of its being easily and thoroughly cleaned in all its parts. Mr. Rickard had asked him how it would work with a mixture of coarse and fine material. The experiments he had made seemed to him to be a conclusive answer to this question. It was quite immaterial whether the stuff went into the machine either fine or at the maximum size it would take. No machine would make a man more conscientious than already he was inclined to be, but in many cases it would put it beyond the power of men to interfere with the process of sampling, for the whole operation could be done under lock and key. Professor Huntington had raised a point as to the size and moisture of the material used. At first he concluded that the opening of the hopper ought to be four times the maximum dimension of the largest piece. From actual tests, however, he found that nothing like this was required. As a matter of fact, the nozzle of the machine exhibited was  $\frac{1}{4}$  inch in diameter, and it easily passed pieces  $\frac{1}{2}$  inch by  $\frac{1}{2}$  inch. Then as to moisture, they had succeeded in passing material carrying 15 per cent. of moisture, by the assistance of a steel scraper. The author concluded by thanking his audience for the kind reception they had given to his paper.

A cordial vote of thanks having, by acclamation, been given to Mr. Clarkson for his interesting paper, the proceedings terminated.

## NICKEL MINING IN NEW CALEDONIA.

## FURTHER CRITICISM.—MR. GARLAND'S REPLY.

AT Wednesday's meeting of the Institution of Mining and Metallurgy, the discussion upon Mr. Joseph Garland's paper on "Nickel Mining in New Caledonia," was brought to a conclusion, long delayed by the unfortunate illness of the author. Mr. Garland was still too unwell to be present, but he forwarded a reply to his critics, which was read to the meeting. Mr. R. H. Williams also sent some remarks upon the paper, which were read by Mr. Collins.

Mr. Williams—to take the critic first—wrote:—I very much regret I am prevented from attending the meeting of the Institution of Mining and Metallurgy, at the Museum, Jermyn-street, to hear the discussion on Mr. Joseph Garland's paper, "Nickel Mining in New Caledonia." The subject is so full of interest to me, having been the largest producer of nickel ore in Europe, and associated and interested in the trade for some 18 or 20 years. In 1852 to 1858 and 1860, the price of refined nickel varied from 10s. to 7s. per lb. The New Caledonian discovery has reduced the price to some 2s. 6d. to 3s. per lb. The large quantities of nickel ore I raised and sold from the St. Austell Consols Mines realised £80 and £84 per ton. This same ore now would only realise £15 or £20 a ton. The mines producing this ore in Cornwall previous to the discovery made in New Caledonia were the Pengelly Mine, the Fowey Consols Mines, the St. Austell Consols Mine. In Scotland the only mine I knew of was one in the domain of the Duke of Argyll. The ore magnetic pyrites produced some 3 per cent. of nickel. It is a remarkable fact that so early as 1790, Dr. Entrecasteaux visited New Caledonia, and in his description says: "The inhabitants of New Caledonia are not acquainted with the use of the bow, but are armed with darts, slings, and clubs, which they make with a great deal of care. Beside fish, which is their principal food, they eat a kind of large spider. The land being in general barren, to appease hunger the men eat a sort of greenish soft steatite." I am of opinion this greenish soft steatite was the silicate of nickel seen in stripes down the sides of the mountains. I have now by me specimens of green indurated clay rich in nickel, and it is most remarkable that it should have been eaten by the natives. It shows clearly that silicate of nickel can have no injurious effects on the human system. The scientific members of the French Commune that were sent out to New Caledonia as convicts soon made themselves acquainted with the contents of this greenish soft steatite, and the result has been to me, I think, now close all the other nickel mines in Europe, if not all over the world. And from the fact that the silicate of nickel as found in New Caledonia renders possible the separation of nickel by the dry process with the furnace, whereas all the other nickel ores in the world could only be separated and refined by the tinned process, and of the most expensive and tedious character. It is quite certain that the New Caledonian ore will keep every other out of the market by its easy mode of treatment. This last remark may require this qualifying—is it not reasonable to suppose the same ore exists in Australia, and if so, it will, when demonstrated, yield a permanent supply of nickel for the world's use?

Mr. COLLINS added, upon his own account, that he thought Mr. Williams was somewhat in error in regard to the separation of nickel from silicate. At any rate, the introduction of a method of the separation of the nickel from the silicate was not speedily accomplished, for he remembered that a few years ago very large quantities of green silicate were lying on the wharves in Liverpool, and could find no purchaser. It was only bit by bit that the method of separating the nickel was adopted upon this ore. In any case Mr. Williams must have overlooked the enormous production of nickel going on in Sudbury. He took it that the methods employed at Sudbury in extracting the nickel from sulphides were not likely to be upset by the larger use of this silicate from New Caledonia.

Mr. GARLAND'S reply was as follows.—Mr. President and Gentlemen,—I regret very much that a long illness has prevented my replying to the discussion on my paper on "Nickel Mining in New Caledonia" at an earlier meeting, and that even now I have been obliged to narrow down my remarks to a degree that will, I fear, cause disappointment to many of the members who took part in the discussion. I trust, however, that the circumstances of the case will ensure the indulgence of all, and will be regarded as some excuse for the incompleteness of my reply. Mr. Cox asks whether any deep sinkings have ever been made to determine if the deposits of nickel ore which have died out and passed into silicate of magnesia occur again at a greater depth. No such case came under my notice, and, I believe, no such desirable trial has ever been made. No copper occurs in the nickeliferous serpentine district; but this metal occurs and has been worked at Balade in the extreme north of the island, and is there met with, I am informed, in the schist formation. Quite a variety of copper ores have been found there, but, I believe, the silicate does not occur. I have been twitted, in a friendly way, by Mr. Cox, Mr. Moreing, and one or two other speakers for my seeming inconsistency in objecting to the two names garnierite and nonneite being applied to what I regard as the same mineral, and then having the temerity to suggest the term "chocolite" for the brown variety of the nickel ore. The fact is I found, when at the mines, the clumsy term "chocolat nickel," or the abbreviated term, "chocolat," in constant use, and the happy inspiration occurred to me that a more useful and a better mineralogical name would be "chocolite." I do not think, therefore, that I can fairly be charged with multiplying names, as my critics contend, seeing that I have simply suggested substituting the term chocolite for chocolat. Mr. Moreing expresses his surprise at the primitive way in which the ore is handled at surface, but I do not think there is much in this to take exception to, when the peculiar circumstances are taken into account. It must be remembered that the relative specific gravities of the ore and its gangue (serpentine) does not admit of water concentration, and that the only concentration possible is that described in the paper, viz., dry dressing—cobbing, screening, and hand picking. Undoubtedly, if the cobbed and hand-selected portions only were utilised as a marketable pro-

duct, the percentage of the ore would be something like double; but the crude smalls which forms the bulk of the ore, and which does not admit of concentration at all, is mixed with the richer portions, and thus the percentage of the metal is reduced to the average, which, I am informed, is about 7 or 8 per cent. As to the wire rope tramways for mountainous districts, I do not think there is any means of transport which is at once so economical, so effective, and so universally applicable. All things considered, I am afraid I cannot support Mr. Moreing's view that there is a splendid opening for some of the out of work mining engineers amongst us to go out to New Caledonia to teach the Frenchmen how to improve their methods. Indeed, the impression left on my mind was that the French engineers have shown in their mining operations considerable skill and resource. Mr. Rickard, after remarking that my paper was a difficult one to speak upon, and that it contained no combative matter, goes on to combat a good many of my statements, and to give us a lengthy and excellent speech, which, when transcribed from the reporter's notes, covers 11 pages of foolscap. To reply fully to that able speech would be to inflict another paper upon this meeting which I am sure I shall not attempt to do. I do not find in my paper the statement which Mr. Rickard attributes to me that the only public company in the island is La Société de Nickel. My statement was that this company, though not the only nickel mining company in the island, is by far the most important. He further states that all the ore is not in the hands of the Nickel Company. My information, obtained on the spot, is that the Nickel Company are the purchasers and shippers of all the nickel ore raised. I understand, however, that the managers of some of the mines are not satisfied with the prices they obtain from that company, and that they talk of shipping their ores direct to Europe. Mr. Rickard states, on the authority of friends of his, that the mines are capable of producing not 60,000, but three times 60,000 tons per annum, and that they have produced as high as 100,000 tons. I make no statement in my paper as to what they are capable of producing. No doubt they could raise greater quantities if they were to work more mines and employ a greater number of men, but what they were actually raising at the time of my visit was, roughly speaking, 60,000 metric tons. In 1891 the total quantity produced was 61,426 metric tons; and for the half-year ending June 30, 1892, the total raisings were 34,557 metric tons, or at the rate of 69,114 tons for the year. These figures may, I think, be taken to be quite reliable, as I obtained them from the highest authority—the Mining Department at Noumea. I was, moreover, given to understand by various mining men that those figures had never before been reached in any one year. My information, as will appear from my paper, extends only to the autumn of 1892, when I left the island. Perhaps Mr. Rickard's information is of more recent date. Mr. Rickard is quite right in assuming that I have no desire to do injustice to the natives. My remarks which were, I believe, well-grounded, applied, however, to the natives of New Caledonia, while Mr. Rickard refers to those of the Loyalty Islands who are, I understand, good workmen. It is edifying to note the off-hand way in which my friend disposes of the question as to how the nickel deposits occur almost invariably in elevated positions; but when he tells us it does not require much ability to account for it, and proceeds to inform us that the ore has not got up there, but that it is simply a question of denudation, one feels that the explanation does not quite cover the ground—it does not, for instance, throw any light, as Mr. Geo. Collins points out, on the absence of nickel deposits in the lower parts of the mountains, as is evidenced by the absence of outcrops. Supposing that denudation has occurred, which is not improbable, I should say, seeing what enormous masses of ironstone cover the plateaus and upper ranges, that does not appear to me to account for the presence of the ore in the fissures and joints of the serpentine at heights, say, of 600 to 1000 feet, and the absence of ore in the fissures and joints of similar rock below an horizon of, say, 200 or 300 feet. If the deposits occurred in the beds, and not in veins and fissures extending some 300 feet in depth, there would be less difficulty in accepting his explanation. I agree with Mr. Rickard that seeing that the nickel deposits are met with in such a number of places over the immense serpentine areas, there is no probability of their being exhausted for a very long period. Some promising seams of coal have been discovered, notably at Dumbes, where they have been exposed by day level, but no attempt to work coal on a commercial scale has been made in the island up to the time of my visit. I think we must all appreciate the useful information Mr. Rickard has contributed to the metallurgy of nickel. Mr. Fowler asks if I know of any analogous deposits to those of New Caledonia. I understand that similar ores are found in two or three places in the United States, as in North Carolina and in Oregon, and that they occur in connection with serpentine rock. I have seen a collection of specimens of the ore from Oregon, and the difference between this ore and the garnierite of New Caledonia is scarcely distinguishable. As far as my information goes, New Caledonia is the only place which has hitherto yielded the silicate ores of nickel in important quantities. The sulphides and arsenides of nickel are not met with in the serpentines of New Caledonia. The outcrops are generally simply green coatings of low grade nickel ore on the weathered serpentine rock. As to the origin of the deposits, I think they are probably segregation veins, and inasmuch as the enclosing rock is found to contain 0.25 per cent. to 0.75 per cent. of nickel, there can be little doubt, I imagine, that the filling of the veins and joints has been due to lateral secretion, or the leaching out of the metal from the serpentine, and its subsequent deposition in the form in which it is now found. As to the origin of the red earth, which Mr. George Collins inquires about, of the two theories he mentions I should be inclined to adopt that of Levat—that it is an alteration product of the serpentine. The cobaltiferous wad, locally termed "cobalt terra," is being worked to a very limited extent. It contains, on an average, about 3½ per cent. of the oxide. I do not know if Mr. O'Donoghue intended to convey that it is a common practice to shift the cable tramways from place to place when the vessels come round the coast to be loaded. No case of this sort came under my observation, or to my knowledge, and seeing that a large proportion of those cables are fixed in almost inaccessible places, I should have imagined it would, as a rule, be impracticable to adopt a plan involving so much labour, loss of time, and expense. The double lineal tramways, referred to in my paper, cannot be rightly described as "little simple things which are moved from one place to another." Mr. Killo contributes some interesting remarks on the metallurgical side of the subject, which my paper does not profess to deal with. Mr. Charleton who, owing to the lateness of the hour, was prevented from speaking at the meeting when the paper was read, has since sent in his comments thereon, but unfortunately, for reasons stated at the outset, I have not been able to give them the attention they deserve. I trust, therefore, he will excuse my not attempting a reply at present to the many interesting points he raises, especially as he will, I think, find that some of the points have been anticipated in my reply to other members. It only remains for me now, Mr. President, to thank you and the members for the kind way in which you have received my paper.

The CHAIRMAN said it only remained for the meeting to express their thanks to Mr. Joseph Garland for his interesting paper, which was one of very great value to the institution—in fact, one of a sort that more than any other was valuable to them, seeing that it was the outcome of investigation carried out on the spot; and the discussion had also been of a very interesting character. From the work of Mr. Claudet it was pretty clear that the "chocolite" ore was nothing but a mechanical mixture of peroxide of iron and silicate of nickel. Mr. Claudet had shown very clearly the result of treating this material with hydrochloric acid. It would be seen from samples Mr. Claudet had brought, that the result of the treatment of acid was that the iron was taken out, leaving the green silicate of nickel, while in the part untouched by the acid the original "chocolite" remained. He concluded by inviting the meeting to give Mr. Garland a hearty vote of thanks for his paper.

The meeting then accorded by acclamation a cordial vote of thanks to the author of the paper which had been under discussion.



## THE EDITOR'S LETTER BOX.

We wish it to be understood that we do not hold ourselves responsible for, and do not necessarily endorse, the opinions of correspondents. All communications must be accompanied by the name and address of the sender, though these need not necessarily be published.

## THE METALLURGY OF LEAD.

TO THE EDITOR OF "THE MINING JOURNAL."

DEAR SIR,—I had hoped that Mr. Hannay's paper would have been subjected to that careful criticism that the nature of the subject deserves. That the work which has been done in the chemistry of lead smelting requires revision in its metallurgical details will admit, and Mr. Hannay has done a distinct service to the science of metallurgy in reopening the discussion. A careful perusal of Mr. Hannay's paper, however, has not convinced me that the reactions and theories advanced by that gentleman are correct; any one comparing the evidence advanced by Percy and that advanced by Mr. Hannay must be convinced that the weight of evidence is in favour of Percy's theories. It is to be deplored that Mr. Hannay has attacked the problem along the lines described in his paper. Very little is known accurately of the conditions which obtain in the reverberatory furnace smelting of lead ores. The temperatures at different stages, the composition of the fine gases at various stages, the volume of air used, &c., &c., are facts requiring determination, and I believe that the chemistry of lead smelting will never be elucidated until such facts, and many others of a like character, have been determined. At the very outset one is met with the difficulty of the temperature at which the reactions occur. It is useless, for example, to infer that because a certain reaction occurs at 1500° C. that the same reaction occurs at 800° C. There is no work to my knowledge bearing upon this point in connection with lead smelting, and one has to be content with the barbarous terms low red and bright red; terms in which no two operators agree, and which has a different significance to the same operator according to the darkness or brightness of the light in which he is working. Consequently, when we endeavour to reproduce the smelting reactions in the laboratory, we can only do so approximately. Mr. Hannay, however, in his experiments has, apparently, not even attempted to perform his laboratory experiments according to the conditions in the reverberatory furnace; and from this point of view alone his theories are to be suspected.

Percy, in his Metallurgy, distinctly states that any mixture of lead and sulphide of lead may be liquated into "comparatively pure lead" and "hard crystalline sulphide of lead," remarking that careful and repeated experiments confirmed him in this opinion. This does not confirm Mr. Hannay's statement that Percy "doubted" the existence of subsulphides of lead. But why does Mr. Hannay, after conclusively disproving the existence of subsulphides of lead, so frequently use the term "subsulphide" in the latter part of his paper?

Mr. Hannay's paper is mainly composed of an attack upon what he calls the "sheet anchor" of lead smelting, viz., the reaction  $PbS + PbSO_4 = 2Pb + 2SO_2$ . The term is inapt, as that reaction is by no means the only one, or even the most important one, which takes place in the reverberatory furnace; nor does Percy give that reaction to be the whole rationale of lead smelting. Percy (page 219) writes—"It (the air reduction process) is founded on the fact that when sulphide of lead is intimately mixed either with protoxide of lead, or sulphate of lead, or with both in such proportion that the oxygen and sulphur in the mixture are in the same proportion as those elements exist in sulphurous acid, and the mixture is heated to a certain degree, complete reduction of the lead takes place." The equations also given by Percy are  $2PbO + PbS = 3Pb + SO_2$ , and  $PbS + PbSO_4 = 2Pb + 2SO_2$ .

Mr. Hannay asserts (1) that these equations are wrong, inasmuch as a certain volatile compound of lead is formed; (2) that as  $PbO$  and  $PbSO_4$  are not formed during the early stages of the smelting operations, the reactions have no existence so far as lead smelting is concerned.

The evidence brought forward to prove the formation of a volatile compound of lead is untrustworthy, and even if the existence of the volatile compound is proved, Mr. Hannay's experiments do not prove that it is formed in the reverberatory furnace. Further, Mr. Hannay is not justified in ascribing the formula  $PbS_2O_3$  to the volatile compound since he has not isolated it, analysed it, or determined its molecular weight. Should the formula ascribed to the hypothetical compound be inaccurate, then the whole of Mr. Hannay's equations must be incorrect. To return to Mr. Hannay's experiments, the *modus operandi* adopted is to melt  $PbS$  in a capsule, and to add  $PbSO_4$ , a little at a time, until the reagents are in molecular proportions. The experiment is, therefore, conducted at a high temperature, the reaction takes place between an excess of melted  $PbS$  and a deficiency of  $PbSO_4$ , and finally the  $SO_2$  is evolved suddenly, and at a very high temperature. Facts, which in my opinion, point to the explanation that the loss of  $PbS$  is partly due to volatilisation, and partly to a mechanical distillation. But examine the experiment in the light of Mr. Hannay's own researches. Experiments are given to show that when the relative amounts of  $PbS$  and  $PbSO_4$  vary that the reactions also vary; thus when the proportions are (equation 1)  $12PbS + PbSO_4$ , then  $2PbS_2O_3 + 2Pb + 9PbS$  is the resultant, but when the proportions are (equation 2)  $3PbS + PbSO_4$ , then  $2PbS_2O_3 + 2Pb$  is formed. Now, if Mr. Hannay adds the  $PbSO_4$  to  $PbS$  by 12ths (and no information is given on this point) on the first addition of  $PbSO_4$ , the result will be as equation 1, i.e.,  $2PbS_2O_3 + 2Pb + 9PbS$ ; on the second addition the relative amounts will be  $9PbS + PbSO_4$ , and what happens no equation is given to show; evidently, however, after each addition of  $PbSO_4$ , the ratio between  $PbS$  and  $PbSO_4$  will vary, and different result will be obtained after each addition. Finally, are the results summed up by equations 3, 4, 5 or 6? But suppose the  $PbSO_4$  is added by 12ths, and the addition of the  $PbSO_4$ , the result will be (equation 2)  $3PbS + PbSO_4 = 2PbS_2O_3 + 2Pb$ , that is, metallic lead will remain. On the second addition the  $PbSO_4$  will re-act on metallic lead, and form  $PbO$ . The third quantity of  $PbSO_4$  will then re-act on  $PbO$  and metallic lead. That is, the following re-actions would take place:—

On the 1st addition  $3PbS + PbSO_4 = 2PbS_2O_3 + 2Pb$  (Mr. Hannay's equation 2.)

" 2nd "  $Pb + PbSO_4 = 2PbO + SO_2$

" 3rd "  $Pb + PbSO_4 = 2PbO + SO_2$

the final result may then be expressed by the equation  $3PbS + 3PbSO_4 = 2PbS_2O_3 + 4PbO + 2SO_2$ . A result which differs very much from any of Mr. Hannay's equations. Now, to be perfectly fair to Mr. Hannay, it is not to be supposed that he waited after each addition until the reaction was completed before making another addition. As I take it, the additions were made by degrees, in order to moderate the violence of the reaction; it follows, therefore, that there must have been a distinct pause between each addition of the  $PbSO_4$ , and consequently, if Mr. Hannay's equations are correct, the varying reactions must have in part taken place. How little

reliance, therefore, can be placed on any of Mr. Hannay's experiments made by such methods! It would be indeed surprising if he did not get excessive losses, not necessarily explained by the formation of a volatile compound.

The experiments to prove that the  $PbS$  is not volatile under the conditions of Mr. Hannay's experiments are also untrustworthy. In one case an inert gas, nitrogen, is bubbled through molten  $PbS$ , and as that gas must have been very much below the temperature of the  $PbS$  there would be a distinct cooling of the latter. In the other case oxygen is bubbled through molten  $PbS$ , with the consequent formation of  $SO_2$ , and an unknown rise in temperature, which might easily have reached the volatilising point of  $PbS$ . One can, therefore, agree with Mr. Hannay "that the volatility was in some way due to oxygen."

Other arguments might be adduced, if space permitted, to show why Mr. Hannay's experiments are not to be accepted, but I believe that the foregoing are sufficient reasons to doubt, or more than doubt, the existence of the volatile body even under the condition of Mr. Hannay's experiment and certainly not under the conditions which hold in the reverberatory furnace.

Mr. Hannay's second attack is much more astonishing than the first. The statement that no oxide and sulphate of lead are formed during the early stages of reverberatory smelting calls for the strongest possible proof, which, however, is not forthcoming in the paper. It seems flying in the face of all trustworthy evidence to assert that no oxide is formed during the three or four hours roasting at a low temperature in the reverberatory furnace. This is the crucial point, which will prove or disprove all Mr. Hannay's theories. If oxide and sulphate of lead are formed—and it is futile to deny that they are formed—then the reactions between those bodies and undecomposed  $PbS$ , according to Mr. Hannay's equations (6) and (20), would work out that during smelting enormous quantities of fume and slag would be formed, and very little lead. On the other hand, if those equations are correct, then the smelting results prove that  $PbO$  and  $PbSO_4$  cannot have been formed.

Mr. Hannay's work relates more particularly to the results which may be expected to be obtained from the converter, and as such has a real value. It does not prove that Percy's work relating to the reverberatory furnace is in the main inaccurate. Mr. Hannay's work may be summed up by saying, first, that the experiments were not performed under analogous conditions to those obtaining in the reverberatory furnace; secondly, that he has not proved the correctness of the equations.

I must apologise for the length at which I have discussed Mr. Hannay's paper, but the importance of the subject must be my excuse.—Yours faithfully, A. W. WARWICK.

Battersea, 15th May, 1894.

TO THE EDITOR OF "THE MINING JOURNAL."

SIR,—I must confess that I cannot understand the position taken by Mr. Hannay in the various sections of his new theories of "The Metallurgy of Lead" and of lead smelting, as exhibited in his recent paper contained in your issues of April 21 and 28, and his further letters in your issues of April 28 and May 12. It is difficult to recognise the claim that his paper is the first attempt to explain the furnace reactions of galena, when he also states that it contains only the faintest skeleton sketch of what, in his opinion, the furnace treatment of galena will become. Taking the sections of his paper in numerical order:—

(1) In your issue of April 28, Mr. Hannay says that Dr. "Percy did not believe in the existence" of sub-sulphides of lead. Dr. Percy records his own experiments, which proved the non-existence of sub-sulphides of lead, so Mr. Hannay is somewhat late in claiming that his experiments are the first that have been made upon the same question.

(2) Mr. Hannay states that the specific gravity of sulphide of lead, obtained in water, is 7.585, the same as Dr. Percy.

(3) Mr. Hannay states that his method of analysis only applies to lead sulphide. Accordingly, Dr. Percy's remarks may be freely applied—viz., that the proposed method will fail by requiring too great an expenditure of time, from inaccuracy of the method, from interference of substances often existing in lead ores, or from other causes. It would be useful if Mr. Hannay would explain how he proposes to distinguish the various metals associated with lead by his new method of analysis.

(4) Mr. Hannay frequently states that the only formula recorded by Dr. Percy as yielding lead from galena is  $PbS + PbSO_4 = Pb_2 + 2SO_2$ . He is somewhat inconsistent, however, for in your issue of April 21 he says that Dr. "Percy gives the main reaction as  $PbS + 2PbO = Pb_2 + SO_2$ ." If you will read Dr. Percy's account of the furnace re-actions connected with sulphide of lead, you will find that Mr. Hannay is in error in stating that Dr. Percy uses only one formula to describe the process of smelting lead. There is no doubt erroneous practice in the smelting of galena, resulting in the useless production of litharge, but this fact does not prove Dr. Percy to be in error. And if Mr. Hannay would carefully read Dr. Percy's valuable book on the "Metallurgy of Lead," he would probably adopt his views.

(5 and 6) The chief point in these sections is that the best result obtained in smelting galena by the Hannay process is a yield of 66 per cent. If Mr. Hannay refers to the Government Statistics for the year 1892 he will find that 40,024 tons of dressed lead ore produced 29,540 tons of metallic lead, and not, as he suggests, as many tons of lead, slag, and fume are produced from ore, slag, and fume. This is equal to a produce of about 74 per cent. of lead as against 66 per cent. by the Hannay process.

It is possible that the loss of lead in the Hannay process by imperfect condensation will be enormous, but if Mr. Hannay will describe the methods by which 99.9 per cent. of lead fume and all the silver can be recovered, he will materially benefit your readers.

I should like Mr. Hannay to give a practical demonstration of his process of smelting galena in his laboratory or elsewhere with the view of determining the exact yield of lead, slag, and fume from a weighed sample of ore whose lead contents are known. If he does so, I have no doubt that many mining engineers will be pleased to be present, including yours faithfully, N. N. N.

May 16, 1894.

## NEW RIETFOUNTAIN.

TO THE EDITOR OF "THE MINING JOURNAL."

SIR,—Writing from Johannesburg, under date April 14, Mr. Alfred Lewis, the well known and trustworthy mining engineer, says, "These shares are going to rise in value, although there is nothing fresh to warrant it—in fact, exploitation only proves that no reefs of any consequence exist in this property, and that the mine must close down some time in May unless something very wonderful happens to prevent it. A final attempt is being made to rig these shares by the crowd, in order to unload on the unwary public. At present this mine is the most discredited on the Rand (and that speaks volumes), and those associated with its working are not gaining much in their reputation, through the wilful suppression of information and official misrepresentation."

Since this information was sent from Johannesburg events have proved only too true that what Mr. Lewis states has a very

good foundation. The rise in the shares the past few days was clumsily worked, and naturally will have little effect, except, perhaps instead of landing the public they will be landed with a further batch of shares themselves, which, no doubt, they are finding rather inconvenient to carry these times.

I think I can claim the right to pose as an authority on the above mine, having for many months past exposed the true position of affairs, although all statements published by me have met with indignant official contradictions. Time has proved, however, that these contradictions were not in accordance with facts, and that Mr. Lewis, who had to avail himself of strange stratagems to inspect the mine from time to time, has not in one instance furnished me with information which was not thoroughly trustworthy and reliable. I am surprised at the apathy shown by the shareholders who have allowed this kind of thing to go on so long without some explanation from the directors. It is records like the New Rietfontein that systematically destroy all confidence and prostitutes legitimate investment in the many good Kaffir properties now being neglected, or are waiting for the support of the Consolidated Gold Fields crowd, who so generously helped to maintain the price of Rietfontein in order to enable those in the know to sell their shares. I would further state that the rumours of a fresh strike are without foundation, or I should have received a cable from Mr. Lewis; on the other hand, allowing that a new strike were made, then why don't the officials make it public? But then, again, even a new strike of reef requires development, so under any circumstances the mine must close down. I hope that your readers will take good care not to be cajoled into buying these shares, or they will lose their money.—Yours faithfully, H. BUSH.

61 Gloucester-place, W., May 9, 1894.

## THE CHAMP D'OR FRENCH GOLD MINING COMPANY.

TO THE EDITOR OF "THE MINING JOURNAL."

SIR,—It might be of considerable interest to shareholders in the above company if, through the medium of your paper, I made public certain further reliable information of a very satisfactory nature.

The output for May will still further show a very appreciable increase from the April return, which is 3600 ounces. The extra cyanide plant is now in full swing, and will return from this source alone an additional 600 or 700 ounces. The reefs now being worked are improving in value every day, and the next month's crushing will show a considerable improvement, and the phenomenal output of over 4000 ounces will be the result of the May crushing and tailing treatment.

In my previous letters I gave the output of April as approximately 3500 ounces, with other useful information, which has all turned out correct. The April crushings show the ore to be of an excellent quality, returning between 13 and 14 dwts. over the plates and the tailings nearly 8 dwts. With this continual improvement the shares cannot long remain at such an absurdly low figure. There are very few mines on the Rand that can show such splendid records, the profits being enormous. The accumulated tailings alone, without taking into consideration the mine, are nearly equal to the present market value of the whole issue of shares.—Yours faithfully, H. BUSH.

25, Bucklersbury, E.C.

## THE SILVER QUESTION.

TO THE EDITOR OF "THE MINING JOURNAL."

DEAR SIR,—The cause of the reduction in the price of silver is not wholly due to increased production. The invention and perfection of "electro-plating" have superseded, to a great extent, solid silverware in family use. But for that invention the increased means of the people of the world would thus have absorbed the increased quantity of silver produced. To rehabilitate silver its consumption must be increased. For a long period its price was 60d. per ounce. The present price is, say, 30d. per ounce—a fall of 50 per cent. There is no doubt but that the metal is at present "panic stricken."

Supposing we were to add an increased quantity of silver equal, say, to 12d. to every ounce of new silver coins. This would nominally bring such value up to, say, 42d. per ounce of such coins. By so doing we would enlarge the use of silver. The use of aluminium as the alloy instead of copper would overcome a part of the extra weight, and the value of the new coins would be further enhanced. A harder coin might also be the result. Such action would remove a strong prejudice in America against the use of its present silver coinage by thus increasing its value. It is my opinion that if there were an "International Agreement," to the effect that each nation should increase, in like manner, their silver coinage, a large portion of the surplus silver new and old would be absorbed, and its supply and demand, thereafter, would be nearer an equality. The addition of 12d. per ounce to such new coins would still leave a margin of 18d. between the 42d., and the old normal price of 60d. per ounce.

The impact thus given to the silver market by the extra quantity of silver consumed in such new coins would increase the price of silver, in the not distant future, probably to 50d. per ounce or more. The seigniorage would still be ample to cover all the expense of such a change, and no loss would accrue to either Government, so altering their silver coinage. The rehabilitation of silver, in my opinion, cannot be brought about by any attempted "fixed ratio" between gold and silver, since the price of the former is comparatively steady, and the latter fluctuates daily. Each metal should stand on its own basis, but worked in harmony as closely as possible. Even a Government cannot ignore such underlying elementary commercial principles as are involved herein.—Yours very respectfully, Cornwall, 17th May, 1894. NANCOWEN.

ALUMINIUM AND NICKEL ALLOY.—At the last monthly meeting of engineers in New York, some remarkable specimens of a new alloy of aluminium and nickel were exhibited. They were sent in by A. E. Hunt, of Pittsburgh, and both were in the form of rolled sheets  $\frac{1}{2}$  inch thick. In one of these a hole about  $\frac{1}{2}$  inch diameter had been drilled out to about 2 inches diameter cold, and the other, which was a strip about 3 inches wide and 24 inches long, had been bent at the middle, the deflection amounting to about 2 inches. It was stated that the force required to do this bending had been about the same as is required to similarly bend a similar piece of 30,000 lb. steel; and when the specimen was placed upon the floor and stood upon by Mr. C. W. Hunt until straightened, it immediately resumed its former shape upon being released. In other words, it seemed to be perfectly elastic within the limits named. The alloy is of a beautiful white colour and of remarkably light weight. No information was given as to the proportion of aluminium and nickel in the alloy, but it probably contains only a small percentage of the latter, and so far as could be judged it bids fair to be an important alloy in cases where lightness and strength are especially desired.—American Machinist.

THE amount of gold won by Mr. Dollar from the Hillendale, Oriental, and Chuchetyre leaders was 31 ounces, 14 dwts. from 30 tons, says the *Umtali Advertiser*.



## AUSTRALIAN GOLD FIELDS.

WE have been favoured with some statistics and information relating to the gold mines and mining companies of Charters Towers, North Queensland, their position and prospects, which we are glad to present to our readers. The following table shows the output, yield, and dividends of the principal mines for the years 1892 and 1893:—

Name of mine.	1892.				1893.			
	Tons crushed.	Yield.	Average per ton.	Dividends.	Tons crushed.	Yield.	Average per ton.	Dividends.
Band of Hope.....	984	2,942	3	—	1,060	3,728	3	—
Bonnie Dundee.....	1,189	1,183	1	—	1,133	1,749	1	—
Brilliant.....	22,134	26,441	1	36,500	25,256	25,789	1	18,753
Brilliant Block.....	6,572	4,532	0	14	7,898	7,893	0	2,500
Brilliant Central.....	131	133	1	—	1,905	2,722	1	1,866
Brilliant and St. George United.....	6,727	7,425	1	2,430	9,849	11,018	1	10,803
Craven's Caledonia.....	1,123	2,952	2	—	3,232	7,894	2	7,500
Day Dawn.....	20,990	23,053	1	49,840	4,850	4,406	0	12,500
Day Dawn P.C.....	14,951	14,483	0	12,500	4,462	8,534	1	—
Golden Gate.....	9,861	17,399	1	20,55	3,206	3,197	1	2,760
Kelly's Queen.....	578	2,895	5	6,800	3,024	6,965	2	15,803
Mill's United.....	22,031	22,141	0	22,500	45,504	51,471	1	97,500
Mosman Gold Mining Co.....	6,215	9,581	1	11	7,898	9,129	1	2,712
New Queen.....	9,534	10,934	1	8,000	6,183	11,073	1	13,918
Papuan Brilliant and Victoria.....	1,37	4,921	3	11	1,211	3,541	2	18
Queen Central.....	104	292	17	20	2,337	2,276	0	19
Queen Cross.....	2,763	2,761	1	6	1,345	1,907	1	8
Victoria.....	4,381	17,833	13	41,400	6,923	15,690	2	32,460
Victory.....	5,755	37,752	4	97,500	13,826	37,584	2	86,000

Many of the above-mentioned have sunk vertical shafts at different periods, and have bottomed at various depths on the famous Brilliant Reef, thus proving the continuity and permanent character of the lode. The reef has been proved to extend throughout the whole of the Brilliant Block property—an area of 36 acres 2 roods and 5 perches, and the prospects of the mine have been very greatly improved by the recent cutting of the Brilliant Reef in the Brilliant Extended on the north, and on the Brilliant Freeholds 1160 feet on the west. The discovery of the rich reef in these two properties was an event which aroused much interest in the colony, and further development of the property is awaited with considerable expectancy. At first sight the capital of Mill's Day Dawn United would appear to be a large one; but when judged in relation to the number of leases held by the company, it is really a moderate amount. The sinking of the vertical shaft to cut the Day Dawn Reef, and so to work the combined area, was commenced at the extreme end of boundary adjoining the Day Dawn Block and Wyndham's Mine, so as to give the whole extent of this property as one workable reef area.

Early in January, 1893, the reef in the main underlie shaft, at a depth on the incline of about 2000 feet from the surface, was found to be no less than 19 feet thick, and it has subsequently been found to reach even 26 feet. Since this period the reef has continued to maintain its great size, and the quartz has improved in richness with increasing depth. Dividends have been paid during the present year to the amount of £18,750. The recent improvement in the prospects of the Brilliant Gold Mining Company has been very marked. Early in the year the returns from the mine were insufficient to pay dividends. In the latter half, however, the discoveries of rich stone enabled dividends to the amount of £18,750 to be paid. A magnificent yield from the Brilliant Reef was reaped by the Victory Company in 1892, during a period of only nine months—viz., from February to December, during which 8735 tons were crushed for 37,752 ounces, yielding the very satisfactory average of 4 ounces 6 dwts. 5 grains, and resulting in a total of dividends amounting to £97,500. The yield of this mine for 1893, it will be seen, has, in the aggregate, not been maintained so far as respects the richness of the ore, though for the first seven months of the year the average yield per ton was 3 ounces 4 dwts. 16 grains. Towards the close of the year, however, the quality of the stone became poorer, and, therefore, in spite of the increased output, the total dividends were £17,500 less than for 1892.

The discovery of a reef at 2015 feet in the Brilliant Extended Mine has gone a long way to prove the Brilliant and St. George United to be very valuable, as it shows that the Brilliant Reef exists beyond the most northerly boundary of the Brilliant and St. George lease, and from the lowest workings in the latter mine to the northern boundary, they will have from 1500 feet to 2000 feet of the lode for sinking upon by a width of about 1200 feet. At the half yearly general meeting of Kelly's Queen Block Company the report presented showed a yield of 4975 ounces from 2075 tons, and dividends to the amount of £16,840, or 5s. a share, were declared.

The Brilliant Central occupies a central position among the Brilliant, Brilliant and St. George, Kelly's Queen Block, Dan O'Connell, New Queen, and Bonnie Dundee Mines. The total of the crushings for 1893 was 1905 tons for 2722 ounces, yielding an average per ton of 1 ounce 8 dwts. 20 grains. The first dividend of 4d. per share was declared early in December last. The Bonnie Dundee is another company whose prospects are said to warrant a higher price for their shares, and the neighbouring mine, the New Queen, is known to contain more than one promising reef. The Queen Cross Mine has an area of 25 acres, and is situated near several valuable properties. That this concern is looked upon as a thoroughly sound one in the colony is shown by the continued firmness of the shares at the time of a financial crisis. As much might also be said for the shares of the Victoria and Queen. The deep ground in Craven's Caledonia showed great improvement towards the end of 1892, and during 1893 it will be seen that 3332 tons were crushed for a yield of 7894 ounces, giving the very satisfactory average of 2 ounces 8 dwts. 20 grains per ton, and resulting in the payment of a dividend of £7500, being at the rate of 1s. 6d. per share, or six dividends of 3d. per share. The mine of the Victoria Gold Mining Association contains the very rich reef known as the Victoria Reef, which was cut a few years since, and has resulted in large amounts in dividends being distributed to the shareholders. The total paid in dividends for the three years 1891, 1892, and 1893 being £14,400, £41,400, and £32,400 respectively. For the year 1892 the dividend represented a return of 227 1/2 per cent. on the total paid up capital of the company (£150,000), and for 1893 £21 1/2 per cent., or about 5s. per share.

One of the last mines in the list, that of the Waratah Gold Mines (Limited), was formed to work the Waratah Gold Mine, on the Croydon gold field in North Queensland. The company intend to erect new, powerful, and special machinery for the proper treatment of the ore, as the machinery available at Croydon is found quite unsuited to this description of ore, which requires grinding and concentration, but is not

refractory. A consignment of 5 tons 6 dwts. of ore from the mine sold to Messrs. Johnson, Matthey, and Co., London, assayed 2 ounces 6 dwts. 12 grains of gold and 55 ounces 10 dwts. of silver, equal to a total average value per ton of about £19. The underlie shaft has been sunk to a depth of 187 feet upon a lode averaging throughout a width of 8 feet. A rich vein of this, 6 inches thick, gave an assay value of £19 1/2 per ton. Four tons of ore from this shaft yielded bullion worth £18, equal to £4 10s. per ton. At the lowest depths reached the prospects have considerably improved, 2 tons having yielded bullion worth £7 15s. 9d. per ton, with concentrates of an assay value of £9 1s. 7d. per ton.

## MINING IN CORNWALL

AND DEVON:  
NOTES ON WESTERN MINING, EDITORIAL  
AND OTHERWISE.

THE dullness which has reigned so long in the Mining Exchange has been intensified this week by the Whitsuntide holidays. Advantage has been taken of the slack times by those who usually frequent the Exchange to prolong their absence, and there has been no disposition to return to a market which at present offers but little scope for speculation. There has been absolutely no business of moment this week up to the time of writing, and the price of tin has been continually dropping.

CAPTAIN BISHOP, the genial and popular manager of East Pool and Wheal Grenville, appeared in the unfamiliar rôle of a defendant before the Camborne Bench of magistrates on Tuesday, in a case which is of the utmost importance to all engaged in metaliferous mining. The charge arose out of a fatal accident which occurred about a month ago. A man named Simmons arrived at the mine one day with some other tutwork men rather later than usual, and the cage which is set apart for the use of tutwork men for one hour was then in use by the tributers. Simmons and his companions, instead of waiting until the cage was at liberty, preferred to break the rules of the mine and descend by the ladder-way in Peare's shaft. This ladder-way is used exclusively by the timbermen and agents for the repairing of the shaft, and the men are prohibited from climbing through the shaft. The footway is not cased off from the skip road as is provided by the Metalliferous Mines Act, and the consequence was that Simmons was struck by the skip and killed. The Inspector of Mines now summoned Captain Bishop for not enforcing the special rules of the mine and so preventing the men from using the footway, and it was maintained by the prosecution that the only way of enforcing them was by summoning the miners who violated the regulations. It was admitted by Captain Bishop that miners were never summoned, but he maintained that men had been cautioned, and special rules published. The magistrates convicted Captain Bishop, and imposed a moderate fine of 40s. The full penalty is £20. The conviction will serve to draw attention to a provision of the law which has, we believe, been hitherto entirely overlooked by the mine managers of the county, and, as the Chairman suggested, the subject is one which might well be discussed at an early meeting of the Mining Association. It is no doubt unpleasant for managers to summon their own men, but if they understand that the alternative consists in being brought before the magistrates themselves they will probably be more alive to their duties in this respect. It is well known that miners are universally very lax in complying with the regulations which are drawn up for the protection of their own lives and limbs, and leniency on the part of a manager under these circumstances is entirely a mistaken kindness.

THE report which Captain Josiah Thomas has issued with regard to the recent run at Dolcoath has to some extent relieved the anxiety of the shareholders, who were beginning to feel rather uneasy with regard to the position of affairs. A week ago they had cleared the shaft for 14 fathoms in depth, and secured it with heavy timbering. The water was then 6 fathoms below the 400, and it was intended to put small pumps underground to draw the water to the 314, and thence back to Harriet's. Opinions differ as to the time which must yet elapse before the deeper levels will be unwatered and open for stoping.

AN action is pending between the adventurers of Wheal Grenville and South Condurrow as to an alleged encroachment, but we understand the case will not be heard until the August sittings of the Stannaries Court. It has been usual in such cases to refer the dispute to an expert, but at Wheal Grenville they seem to be of a decidedly litigious turn.

SOUTH FRANCES meeting was held on Thursday, and the result of the last four months' working was regarded by the shareholders as very satisfactory. A loss was shown of £1200, but quite £1000 of this was spent in the sinking of Daubuz's shaft, one of the most important pieces of work undertaken by the adventurers for a long time. In addition to this, an accumulation of calls on forfeited shares was written off the books, so that practically on the ordinary working of the mine there was no loss at all. They have sold 45 tons of tin more than last time, and there is certainly a fair prospect of the increase being at least maintained if not materially enhanced. Daubuz's shaft is now down to a depth of 120 fathoms from surface, and is being sunk at an exceptionally good rate considering the hardness of the ground. The lode in the 246 west, which improved at one time to the value of £35 or £40, and then became disordered, is now again well defined and worth £15 per fathom, with every indication of a further improvement.

RECEPTION AT THE IMPERIAL INSTITUTE.—At the invitation of the Agent-General for Western Australia, a number of guests and Fellows assembled on Saturday last at the Imperial Institute, when particular attention was paid to the trophy of gold lately remitted from the colony, valued at £35,000, and to a collection of pearls and carved oyster shells. In the afternoon Sir Malcolm Fraser held a reception. Amongst the guests present we noticed the following:—Sir Frederick Abel, Bart.; Mr. and Mrs. A. J. Barber, C. Bethell, R. Bush, C. E. Broadhurst, Major-General Brooke, Colonel Sir E. Bradford and friends, Lord and Lady Brassey, Mrs. Bonbury, Mrs. H. W. Bond, Mr. Albert F. Calvert, M.E., F.R.G.S., &c., B. L. Cohen, Esq., M.P., Mr. and Mrs. G. Clifton, Sir Daniel Cooper, Bart., Lieut.-General Sir Andrew and Miss Clarke, Mrs. Dingle, Mr. and Mrs. Farmer, Edward Fairfield, Esq., C.M.G., Mrs. J. A. Game, Mr. W. J. Gwyn, Lady Goldsworthy, Sir Douglas Galton, K.C.B., J. H. Hargan, Esq., M.P., Mrs. T. H. Hol', General Harvest, Capt. and Mrs. Harvest, Hon. Mrs. Joyce, Hon. G. Johnstone, Mr. and Mrs. J. H. Keane and the Misses Keane, Mr. C. J. Keep, Mr. J. Livingston, Mr. Richard J. Middleton, F.I. Inst., Manager of The Mining Journal, Mr. and Mrs. Lapage, Sir Thomas Lucas, Bart., Miss Maurice, Miss Moore, Messrs. C. Mitchell, W. Mendel, W. Marden, C. Moore, Matthew Macfee, Colonel and Mrs. Meyer and the Misses Meyer, Colonel J. F. North, Mr. and Mrs. J. F. O'Halloran, Mr. and Mrs. J. C. Prinsap, E. B. Pennell, Esq., C.M.G., Miss H. Parker, Sir W. B. Lady Perceval, Right Hon. Sir H. Robinson, Bart., G.C.M.G., Lady Robinson, Dr. and Mrs. Robertson, Mr. A. H. P. Stoneham, Colonel James Skinner, Miss F. Shaw, Mr. Edwin Streeter, Major-General Sim, R.E.; H. Spence, Esq., M.P., Mr. E. J. Stubbs, and Miss Stubbs, Miss E. Smith, Mr. O. J. Trinder, Mrs. Theiler, Sir Charles and Lady Tupper, Sir J. K. Somers-Vine, C.M.G., Mr. O. J. Wainwright, Mr. E. Wainwright, Mr. and Mrs. John Waddington, Sir Frederick Young, Mr. and Mrs. Young, Mr. S. Yardly, C.M.G. and others. Their H.H.H. the Prince of Wales and the Duke of York inspected the Coolgardie gold at the Imperial Institute.

## FORTHCOMING MEETINGS.

\* We shall be obliged if Secretaries or other Officials of Mining, Railway and other Companies will be good enough to advise us as early as possible of the date, time and place of their forthcoming meetings—whether statutory, semi-annual, annual, general or extraordinary, confirmatory or adjourned—in order that particulars may be announced for the benefit of our subscribers and more particularly our country readers. Balance sheets, reports and other notices to be submitted for such meetings should, where possible, accompany the intimations of the meetings sent.

Name of Company.	Date.	Nature of Meeting.	Place.	Time.
Booyen Land and M'g Co.	May 21	General	Cannon-street	2.0 p.m.
Palmarejo M'g'g Company	May 22	General	Winchester Ho.	2.0 p.m.
Mason and Barry .....	May 22	General	Cannon-street	3.0 p.m.
British Broken Hill .....	May 22	General	Winchester Ho.	1.30 p.m.
Mosman Gold .....	May 22	General	Cannon-street	2.0 p.m.
Kangarilla Silver Mines .....	May 22	General	Cannon-street	12 noon.
Gold Fields of Mysore .....	May 23	General	Queen st. pl.	11.30 a.m.
London & S.A. Explor'n Co.	May 23	General	Winchester Ho.	2.0 p.m.
San Sebastian Nitrate Co.	May 23	General	Winchester Ho.	2.30 p.m.
Rosa Grande Gold Co.	May 23	General	Cannon-street	12 noon.
Central Argentine Railway .....	May 24	General	Winchester Ho.	11.0 a.m.
Santa Fé Land Company .....	May 24	General	Winchester Ho.	2.30 p.m.
Bonnie Dundee Company .....	May 24	General	Cannon-street	12 noon.
Pigg's Peak Estate .....	May 24	General	Cannon-street	12 noon.
Metropolitan Coal Co. of Sydney	May 24	General	Cannon-street	2.0 p.m.
Nobel's Explosives Company .....	May 25	General	Winchester Ho.	1.0 p.m.
Central Africa and Zulu .....	May 25	General	Winchester Ho.	12 noon.
Oceana Transvaal Land Co.	May 25	General	Cannon-street	12 noon.

## THE GEOLOGY OF MONTE CHABERTON.

By A. M. DAVIES, Esq., B.Sc., F.G.S., and J. W. GREGORY, D.Sc., F.G.S.

THE importance of the Chaberton district, as affording a key to the general geology of the Cotians, was explained, and the opinions of previous observers referred to. The mountain was examined from three sides—that of the Grand Vallon; the approach from Mont Genève by the Col de Chaberton; and that of the Clos des Morts Valley. The following are conclusions arrived at:—

- (1) The well-known Chaberton serpentine is intrusive into the calc schists, and yields fragments to the *carnegies* of the trias; it is, therefore, a *pre-Triassic* intrusion.
- (2) There are on the mountain other fairly basic schistose rocks (quartz-chlorite-schists) which cut the Trias, and are, therefore, *post-Triassic*.
- (3) The contorted beds in the Clos des Morts Valley are fossiliferous limestones, and it is from them that the fallen boulders previously recorded were derived. The only recognisable fossil is *Calamophyllia fenestrata*, Reuss, a characteristic coral of the Gosau beds. In spite, therefore, of the doubts of Kilian and Diener, the opinion expressed by Neumayr as to the existence of cretaceous rocks in this part of the Alps is confirmed.
- (4) The earth movements of the mountain are described: they include ordinary folds, inversions, faults, and an important thrust plane.
- (5) It is suggested that in addition to the two series of intrusive rocks above mentioned as *pre-* and *post-Triassic*, a third series of late Cretaceous or Tertiary date may be represented in the Mont Genève and Rocciavré masses.

## Discussion.

Professor COLE congratulated the authors upon their survey of a difficult mountain area. To him the most interesting rocks were the schistose dykes near the summit of Monte Chaberton, showing how much metamorphism might have taken place in the *pietre verdi* generally since Triassic, and probably since Eocene times. He believed that the metamorphism produced in the Alps by Cretaceous earth movements equalled anything that had gone on in earlier eras.

Dr. J. W. GREGORY also spoke. Mr. A. M. DAVIES, in reply, pointed out that the remarkable way in which the varicolitic rocks of Mont Genève had escaped crushing was one of the facts that pointed to their very recent date.

\* Abstract of paper read before the Geological Society of London.

PROSPECTING on the surface of the Battery Reef property (Lui-paard's Vlei Estate Company) has led to the discovery of a payable reef 1000 feet west of the main vertical shaft.

At the Modderfontein property the 16,000 tons of ore already in sight are expected to give 10 dwts. per ton over the plates. It is hinted that at the coming meeting a second reconstruction scheme will be put before the shareholders for consideration.

MR. ROBERT WILLIAMS writes from the Rand, and says that each engineer who travels through Mashonaland emphasises the good reports that have been previously received in respect to the Pennalunga range and other properties in the district.

NINE HUNDRED AND FIFTY-NINE tons of gold ore were shipped from Trail Creek, says the *Miner*, British Columbia, during the fortnight of April for treatment by the cyanide process. The bulk went to Butte and a smaller quantity to Tacoma.

## GOLD MILLING.

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**CONTENTS**

Of this Number of "The Mining Journal, Railway and  
Commercial Gazette," May 19, 1894.

NEW PATENTS ... ..	533
CONTRACTS OPEN ... ..	533
OUR INQUIRY COLUMN ... ..	533
HOW RUBIES ARE MADE ... ..	534
MINING AT THE ANTWERP EXHIBITION ... ..	534
MECHANICAL ENGINEERING, &c. Coal Weighed Automatically; Progress in Electric Lighting and Transmission of Power; The "Monarch" Patent Rock Drill for Electric Power ... ..	535
CARROCK FELL ... ..	535
SPECIAL CORRESPONDENCE: Colonial and Foreign. Mining in Asturias (Spain); Our Paris Letter; Our South Aus- tralian Letter ... ..	536
THE SOUTH AUSTRALIAN PETROLEUM FIELDS (LIMITED) ... ..	537
THE SAMPLING OF ORES AND TAILINGS ... ..	537
NICKEL MINING IN NEW CALEDONIA ... ..	539
REVIEWS ... ..	539
PUBLICATIONS RECEIVED ... ..	539
THE EDITOR'S LETTER BOX ... ..	540
AUSTRALIAN GOLD FIELDS ... ..	541
MINING IN CORNWALL AND DEVON ... ..	541
FORTHCOMING MEETINGS ... ..	541
THE GEOLOGY OF MONTE CHABERTON ... ..	541
LEADING ARTICLES— Capital for Home Mining—How is it to be Raised? ... ..	542
The Working Expenses of Gold Mining ... ..	543
NOTES AND COMMENTS ... ..	543
OUR CITY ARTICLE ... ..	544
MINING NOTES ... ..	544
A GOLD RUSH IN NEW MEXICO ... ..	545
LATEST FROM THE MINES: Cablegrams and Telegrams ... ..	545
THE METAL MARKETS— The London Metal Market ... ..	545
"THE MINING JOURNAL" SHARE LIST ... ..	546-547
COMPANIES AND THEIR DOINGS ... ..	547
REPORTS FROM THE MINES ... ..	547
RECENT TRIALS OF A NEW MODE OF TIN DRESSING AT BOTALLACK ... ..	550
GEOLOGY AND MINERALOGY OF SHASTA COUNTY ... ..	550
CARBONIFEROUS AVENARIUS ... ..	550
PROVINCIAL SHARE MARKETS ... ..	551
MINING IN MEXICO ... ..	552
ADVERTISEMENTS—(See Index to Trade Advertisements, p. 558).	

LONDON: MAY 19, 1894.

## CAPITAL FOR HOME MINING—HOW IS IT TO BE RAISED?

WE gave last week a list of 16 leading mines in the West  
of England, which during their present period of work-  
ing, averaging about 50 years or a little more, and with  
a total capital called up and paid of about one million sterling,  
have given more than three millions in dividends, and are still  
worth nearly one million, as shown by the most recent share  
quotations. Almost every one of these mines had been pre-  
viously worked more or less extensively, and had yielded large  
profits, and hundreds of others could be cited, which having been  
equally profitable are now idle, to the great loss of the district  
and of the country generally. As to the causes of this idleness,  
they are very various, such as neglect of proper advance works,  
bad or insufficient machinery, sudden and alarming falls in prices,  
deaths or bankruptcies of leading proprietors, accidental flooding,

&c. Of these adverse conditions, the only one of a permanent  
nature is the lowering of the prices of metals and ores. As  
regards copper, the fall in prices has been so great that we fear  
vein mining for copper *per se* can hardly be expected to pay—at  
any rate in the immediate future. But with tin, the real metallic  
staple of the West of England, the case is very different, for im-  
provements in methods have, in the main, kept pace with falls  
in price, and every mining engineer who is really acquainted  
with the West of England will bear us out in saying that there  
are scores of places where the judicious expenditure of capital  
could hardly fail to give results as good as those to which we  
have already referred. If there were still to be found real  
"speculative investors" in mines as in the old times there would  
be no difficulty in raising the necessary capital for such home  
mining enterprises. But we much fear they have either  
died out, or have become degraded into mere market speculators,  
caring nothing for the mines themselves, but only for the  
chances of "bulling" and "bearing," and lately the prices of  
metals generally, and of tin and copper in particular, have been  
so much depressed as compared with the purchasing power of  
gold, and the corresponding amounts paid in wages (calculated  
always on a gold basis) that the "bears" have had matters  
pretty much their own way. Between 1830 and 1845 East Pool,  
Carn Brea, Tincroft, and Dolcoath were all practically abandoned  
mines. All were situated in a district known to be good, and,  
though it was something of a struggle to get them re-opened  
their working since then has been highly profitable. It is well  
known locally that there are many similar mines unworked in  
the West of England at the present time. How can the abso-  
lutely necessary capital for working them be got? Let us sup-  
pose a proposition for re-starting one such. In the old Cost-  
book days it was easy enough. A few local people who knew,  
and were interested in the locality, met together, and  
agreed to provide the capital in certain definite pro-  
portions a little at a time as it might be wanted,  
asking their friends to join them in doing the same. If  
the early operations were encouraging they gradually dipped  
deeper into their pockets; if discouraging the affair was given up  
either individually or altogether. Sometimes, of course, it  
happened that their money was altogether lost, but if so they  
had the satisfaction, as "mining adventurers," of knowing that  
it had been spent in mining; they were not much discouraged,  
and were soon ready to try again, knowing that one success  
would pay for many failures. The Limited Liability Acts, with  
their considerable preliminary expenses, their more formal orga-  
nisation, their less frequent meetings, and their less detailed  
accounts, have quite unexpectedly, but not the less, really  
changed all this. This change has, in part, resulted from the  
now widened range of the investments of the investing public;  
in part, too, from some notorious abuses of the Cost-book  
System; and it has not been checked. Rather, it has been urged  
forward by certain facilities which the Limited Liability Acts  
afford for the safe practice of still greater abuses. However,  
whatever may have been the cause, we all recognise the fact that  
capital for new mining adventures must for the present, at least,  
be raised in the modern way. Let us see what this involves  
under the most favourable circumstances for such an  
enterprise as we have indicated above. In the first  
place, to reopen such a mine as East Pool was  
60 years ago, the capital of the company could not reasonably  
be fixed at less than £20,000; for though a much smaller  
amount actually proved sufficient, it might not have been so.  
And practically an actual subscription of £3000 under the old  
system was equal to a much larger one under the modern sys-  
tem; for, supposing a very moderate degree of success in the  
early working, the larger sum could be easily and almost auto-  
matically called up, though the adventurers would not have  
subscribed the larger sum at the start.

Now, to get £20,000 subscribed in the modern way some one  
must incur a very considerable expense. Let us suppose a group  
of legitimate promoters formed and ready to provide the neces-  
sary funds. To acquire the sett may not be very costly, but it  
will cost something. In the old days, and among neighbours,  
a verbal promise of the lord's agent was sufficient, but it would  
not be safe to "go to the public" without documentary  
rights, which might easily cost £500, but which would  
certainly be cheap at £100. Similarly, the Memorandum and  
Articles of Association must be drawn up and printed under  
legal advice, and then the company must be registered; and cer-  
tainly £150 more will not be too much to reckon for that. Next  
comes either a widespread appeal to the public—very costly in  
printing, postage, and clerical work—or else an arrangement  
with "underwriters" to "find the capital." In the first case  
another £100 would be considered a very moderate expenditure  
thus involving a total cash preliminary outlay of £350, of which  
probably six-sevenths could have been saved under the old  
system. Now, what amount may the promoters fairly expect for  
finding this £350? If we consider the chances for and against  
the required capital being obtained from the general public, they  
would in these times be reasonably estimated at 10 to 1 *against*,  
so that the promoters might fairly expect to get, if successful,  
from £3000 to £4000 in cash, or a still larger amount in shares.  
If the alternative method of underwriting the capital be adopted,  
it will certainly not prove more advantageous to the company  
in the long run. In either case the total available capital of  
the fully subscribed company will be reduced by one-fourth or  
more, and the promoters have to be in reality, if not in name,  
vendors.

In the meantime the selection of a board of directors has been  
made, and as the public always look for a few ornaments  
names, the promoters will have had to take that into considera-  
tion in making their selection, and they will be fortunate if they  
do not have to share their gains in some way with the gentle-  
men selected. However, let us suppose all this to have been  
arranged, and the company to be formed with an available  
capital of, say, £15,000, with which to earn dividends, if successful,



on a nominal capital of £20,000. We must now consider what are likely to be the management expenses. Apart from the high fees proper to ornamental directors (you can't offer a distinguished or titled gentleman a really small fee), the Limited Liability Act calls for so much more in the way of formal returns (to be duly buried in Somerset House) that the clerical and office expenses are generally, at least, doubled as compared with a Cost-book company of equal extent. For a company such as we have in view the local management, including clerical labour, under the old system would probably be not over £250 per annum, while the office expenses proper—whether in London or in Cornwall—would be covered by another £100. Under the Limited Liability Acts, a London office is almost a necessity, and its cost added to the directors' fees would be moderately estimated at £400 per annum.

Let us now suppose that after two years' working, and when 10s. per share has been called up, the mine begins to make returns exceeding by £1000 its local expenditure. The amount actually spent on the mine at this date will be somewhat as follows:—

10s. per share on 20,000 shares, equal ..	£10,000
Less 10s. per share on 5000 shares issued as fully paid for promotion expenses .. .. .	£2500
And less two years' London office expenses at £400 .. .. .	800
	3,300

Amount actually spent on the mines .. .. £6,700

Obviously our assumed profit of £1000, after deducting £400 for office expenses, is equal to about 9 per cent. on the capital actually expended on the mines, or to 6 per cent. on the nominal capital of the company as actually called up. Under the Cost-book arrangement the £1000 would only be lessened by £100 for office expenses, leaving £900 for division, which on a total expenditure of, say, £7000, would be equal to 13 per cent.

## THE WORKING EXPENSES OF GOLD MINING.

IT is hardly necessary to point out to those mining investors who have followed with an intelligent interest the recent course of auriferous mining that cheap production is becoming more and more the chief element of success in that branch of enterprise. Formerly, the primary element of profitable working was the richness of a mine, but this has so far been relegated to a secondary position that many poor mines are now paying dividends, whilst others, with a larger percentage of gold to the ton, are being worked at a loss. The days of nuggets and free gold seem to have vanished for ever, and the prospects of a mine are to be measured less by the number of pennyweights or ounces of gold to the ton of quartz than by the efficiency with which the treatment of low grade or refractory quartz is accomplished, and the influence of general conditions in producing a low rate of working expenses. The strongest indication of this tendency is afforded in the investment of millions of money in the Transvaal deep levels upon the strength merely of specimens, and those of low grade ores, extracted by the diamond drill. The blanket formation of gold seems, in the uniformity of its yield, to bear more relation to coal mining than to any other branch of the metalliferous industry. What is more, we seem at present to be only upon the threshold of its exploitation, and we cannot tell to what an insignificant amount of the precious metal the payable proportion in auriferous quartz may be ultimately reduced. It must be remembered that gold mining invention has not been confined to the Witwatersrandt, although we have heard of most of its achievements there. In the Ural Mountains a great deal has been done to open new possibilities for the treatment of refractory pyritic ores, and attention has lately been largely directed to the same subject in Australia. Still, besides the large field for scientific mining which is opening up in Western Australia, there is no doubt plenty of room for the application of improved processes on the old gold fields of New South Wales and Victoria. Australian gold mining was spoiled as a field for the cultivation of economical methods by the richness of the earlier finds. It is curious that Australian miners have contributed hardly anything to the vast body of technical progress which has been made on the Witwatersrandt. The remarkable achievements carried out there have been almost entirely due to American and European experts. In India, again, where the loss of shareholders' money and the forsaking of old gold fields have been due to wrong treatment of low grade and refractory ores, the lesson of the South African auriferous industry is now being taken to heart. Over a large part of the gold fields of India somewhat the same geological conditions as those which have proved so fertile on the Witwatersrandt would appear to prevail. With such enormous deposits of poor ore in nearly all parts of the world, there is ample scope for the carrying on of a mining industry, by economical means, upon a remunerative scale. New coal fields also are being opened up in many parts of the world, so that the question of fuel supply promises to resolve itself into a very simple one. Then in the actual operations of mining an important economy is likely to result from the competition which has lately entered into the supply of blasting explosives. The Dynamite Trust is menaced from several quarters, and in particular the American producers threaten a very formidable competition against the European monopoly. A serious item in the expenses of up-to-date gold mining has been the expenditure upon cyanide of potassium, the chemical required in the treatment of "tailings" by the MACARTHUR-FORREST process. Not only is the validity of the patents, and the consequent payment of royalties to the company which possesses it, in dispute before the courts

of law, but chemical manufacturers in Europe are awakening to the wide demand for cyanide in various parts of the world. They are going in for producing it against the very small circle who have hitherto monopolised its manufacture, and within the past month or two the price has fallen, at the very introduction of this new element of rivalry into the business, 20 per cent. This is a most important matter for companies working low grade ores, and the present decline will very probably mean giving concerns, which are not at present paying anything to their shareholders, the opportunity of earning dividends. The tendency towards cheaper treatment of gold ores is, indeed, striking. Not the least powerful of its manifestations is the disposition to employ huge capitals to work enormous properties, by which much saving both in the technical and the administrative work is secured. It seems as if before long a ridiculously small, nay infinitesimal, content of gold will become profitable wherever the management is capable, and the purchase of the property in the first instance has been carried out with due regard to the interests of shareholders.

## NOTES AND COMMENTS.

THE Mosman Gold Mining Company have managed to pay a respectable dividend during the past year, despite the grave difficulties against which the directors have had to contend. Unfortunately, the working expenses upon the property have been kept at an unusually high figure by the narrowness of the reef and the large amount of material to be removed in order to get at the gold. Everything possible has been done to effect a reduction in the labour costs, hitherto, however, without success. "The manager reports," say the directors in their annual statement, "that it is impossible to work at less cost." And they proceed to indicate that any increase in profit must be expected either from an extension in the size of the reef, or else an improvement in the quality of the ore. The operations carried on by the company have been industriously pursued during the year. Nearly 8000 tons of quartz have been treated in the 12 months; but the fact that the ore was not far within payable quality is responsible for the comparatively small balance paid in dividends. A mill of 10 stamps has been continuously running to crush the company's ore; but this capacity has not been sufficient to treat the quantity raised from the mines, and some 300 tons were sent elsewhere. Wyndham shaft has been sunk an additional 98 feet during the year, with not very hopeful results, and the occasional pinching out of the reef has both increased the expenditure upon wages and explosives, and reduced the value of the stone sent to the mill. Under these depressing conditions the payment of a dividend is an achievement with which the directors have some reason to be satisfied.

We learn this week that the South Australian Petroleum Fields (Limited) has been successfully reconstructed; that ample working capital is now provided; and that the directors anticipate a prosperous future for the company. This is the best news we have heard of the company for a long time. We had really given up all hopes of hearing of it again. We were beginning to think—we will not say to hope—that it had been consigned to oblivion. Many inquiries have been addressed to us from time to time asking if we knew what had become of the company, as no information had been vouchsafed to interested or uninterested parties for a considerable time. At length we have the circular addressed to us, giving the information which we have quoted at the head of this note, and accompanied by a report on the property by a Mr. George Adams. We have reproduced the latter *in extenso* in another part of our impression. The tenour of it may very easily be imagined without the trouble of perusing it. It is a favourable one. The directors would not anticipate a prosperous future were it of the opposite opinion. It speaks most encouragingly of the Burma property. It lays stress, and rightly so, on the favourable leases that have been granted to the company by the Indian Government; on the position of the property; on the importation duty; on the low cost of working, &c. He remarks that the ore produced is of excellent quality; that it can be easily worked, with a small percentage of loss, and infers that it will find a ready and profitable market. Well, we hope that this is really a turn in the fortunes of the company. They have struggled in the past without conspicuous success. We do not prophesy a profitless future, nor do we express unbounded faith in the property. We only hope the company will meet with success.

THE little breeze which has occurred at the sitting of the International Congress of Miners will be regarded as a misfortune by those who are in sympathy with the objects of that gigantic organisation. Where men are strongly bound together by common conviction and common ends, these should be placed far above any merely personal question of precedence. What did it matter who presided over the deliberations so long as the objects of the gathering were fulfilled in a just and orderly manner? The dispute between the German and British representatives ended in the election of a Frenchman, and the forfeiting of whatever honour the occupancy of the chair may be supposed to carry with it is a punishment befitting the initial display of jealousy. The fragmentary reports which have come to hand represent our fellow-countryman, Mr. Wilson, as bearing down upon the presidential stall with all that quickness of initiative and zeal for possession which foreigners tell us has characterised our schemes of colonisation in the past. The result of this display of enterprise was still in doubt when Mr. Wilson showed his good sense by suggesting that the question should be put to the vote, which was done with the result already noted. What an unspeakable triumph for *La Belle France*! The

whole thing reminds one of a most celebrated and applicable fable.

SCARCELY a day passes but what we hear of some new discovery of gold, and there is scarcely any mining region in the world which does not furnish us with these promising signs. There is one thing which they possess in common. They are all wonderfully rich, and it is only after minute inspection, patient waiting, and expenditure of capital and energy, that we find out their worthlessness. We present the following, culled from our South Australian contemporary, without further comment:—"A communication full of interesting matter has reached us from the heart of the Continent. Among the vast mineral tracts of the interior which have been just touched upon by the mineral explorer is the McDonnell Range country, in which gold, gems, and mica have been found, and in which indications of great mineral wealth have been met with. We are told by our correspondent that the great impediment to the prospecting of the mineral country, which is thousands of square miles in extent, is the want of water, and that owing to this drawback, and the high cost of living, the operations of the few miners on the field have been confined to a very small area. Alluvial gold mining has, under these restrictive influences, not proved a very great success, and reefing has not been carried on to such an extent as to enable any reliable judgment to be formed of the resources of the field in this direction. He is, however, of opinion that there are immense quantities of stone that would yield from 1 ounce to 3 ounces to the ton, and in proof that other people have an idea that the reefs will pay, we are told that three companies are now taking steps to test some of the claims. Our correspondent says that there is a large tract of auriferous country to the west of the McDonnell Ranges in which immense reefs are to be found, but which have not been seen by more than one or two white men, and have never had touch of pick. The mica deposits of the McDonnell Ranges are highly spoken of, and it is stated that all that is needed to ensure the development of a profitable and important industry is the guarantee of cash returns for the product of the miners labour within a reasonable time instead of their having to wait as at present, from six to twelve months. The gem mining industry is briefly referred to, but it appears that since the discouraging reports upon the rubies or garnets sent down by the sackful some time ago, the search for gems has not been systematically prosecuted."

THE increasing frequency with which Australian diamonds emeralds, sapphires, and other gem stones are making their appearance in the British markets has naturally awakened some curiosity respecting the extent to which they are found in a country hitherto associated with ideas principally of wool and the precious metals. In New South Wales the existence of the diamond was known so far back as 1851, but no systematic efforts in the shape of diamond mining were made until 1869, when a diamondiferous locality at Cudjagong, a few miles from Mudgee, discovered by some gold diggers in 1867, yielded considerable numbers of the precious stone, mostly of small size, the largest being between five and six carats. Some few years later diamonds were discovered near Bingera, from the neighbourhood of which, up to the present time, several thousand small diamonds have been obtained. There are other localities in which diamonds are found, and at some future date, when the necessary experience and capital are forthcoming, diamond mining will occupy a leading place among the industries of the colony.

THE wash-dirt in which the diamonds are found contains numerous small sapphires, rubies, garnets, and other gem stones and mineral substances. No official record of the number of diamonds found is kept, but Mr. Coghlan, Government Statistician of New South Wales, estimates that up to the end of 1887 it was 50,000. The New South Wales diamonds are harder and much whiter than the South African diamonds, and are classified on a par with the best Brazilian gems. During the year 1889 the Malacca Company, near Tingha, found diamonds weighing 2195 carats, valued at £378 5s. In 1891, 12,000 carats of diamonds were won in the Tingha and Inverell districts, but no value has been given. Practically, the diamondiferous districts of the colony, even that at Bingera, have never been fully prospected, although they are known to be numerous and extensive. Among other gem stones found in New South Wales are the sapphire, emerald, oriental, ruby, opal, amethyst, garnet, chrysolite, topaz, cairngorm, onyx, zircon, &c., which are frequently met with in gold and tin-bearing drifts and river gravels in many places throughout the colony.

EMERALDS of good quality have been found in abundance at Emmaville, in the northern part of the colony, where the Emerald Proprietary Company have sunk two shafts, 100 feet and 50 feet respectively, from which 25,000 carats have been won in a rough state; their value when cut and finished, if of the best quality, is about £10 per carat. Some of the specimens shown in Sydney were extremely beautiful, and as the mines are more fully worked, stones of the richest character will probably be found. At White Cliffs, near Wilcannia, in the north-western portion of the colony, extensive deposits of opal have been discovered, principally in beds of conglomerate and kaolin. Here a township has sprung up in the formerly uninhabited wilderness, the value of the opal sold during 1893 being estimated at from £18,000 to £20,000. Opals have also been discovered near the Abercrombie River and near Lismore. Gem cutting is virtually an unknown industry, the larger stones being sent to Europe to be cut and polished. Comparatively few of those engaged in the search for gems have any practical experience, save what they have obtained in Australia, otherwise it is probable that more extensive and richer discoveries would have been made long before the present time.

ACCORDING to Mr. Edward Pope's monthly report the share market at Gympie maintained its activity during the month of



March. The returns were treble those of the corresponding period of last year. The mining developments were of great importance, and bid fair to have a permanent influence on the welfare of the gold field. The quantity of ore crushed during the month was 7274 tons 6 cwt., which yielded 10,387 ounces 13 dwts. of gold. The tonnage crushed during the quarter was 17,959 tons 12 cwt., and the gold won was 21,422 ounces 11 dwts. 18 grains. The dividends paid amounted to £21,750, making the total for the quarter £40,083 6s. 8d. During the month thirty-three companies made calls amounting to £2843 15s., making the total called up during the quarter, £30,485. The dividends for the month exceeded the calls by £14,906 5s., and for the three months by £19,598 6s. 8d. By a calculation made on the 1st of April, based on local market prices, he estimated the value of the mines to be £423,446, or an increase of £38,999 during the month, and of £105,200 in the last two months. The aggregate value on April 1st last year was £280,380.

The great Monkland Mine supplied the most important discovery of the month, and, perhaps, the most important made since the finding of the Great Eastern reef about eight years ago. This discovery consisted of cutting a large body of leaders, almost everyone of which carried gold, in the 1479 feet cross cut at a point 180 feet south west from the shaft. The manager's opinion of these leaders can be worked profitably, as although each leader is small it appears to be sufficiently rich to pay for breaking and crushing the gangue between itself and the next one. So far, the cross-cut has gone through about 12 feet of this formation of auriferous leaders, and is not yet through it. This gold is being got over 406 feet deeper than any previously obtained here. The Phoenix Company had a very successful month's operation on the Smithfield reef. They crushed 1237½ tons of ore and obtained 4060 ounces smelted gold, and paid 4s. 10d. per share in dividends, amounting to £12,083 6s. 8d. Mr. Pope assures us that the mine is looking as well as ever. The North Smithfield Company crushed the first lot of ore from their workings at 468 feet, near the Phoenix Company's boundary, and 29½ tons yielded 467 ounces of gold. They also cleaned up the first crushing of ore taken from the reef struck at the 715 feet level, and obtained 780 ounces of gold from 213 tons. Two dividends were declared during the month amounting to £3600.

An interesting story respecting the discovery of a new gold field comes from Tallangatta (Victoria) where at the present time great excitement prevails. It appears, says the *Argus*, that a young man, named Isaac Macklan, was out opossum-snaring, and while resting on the top of a hill saw a loose piece of stone lying by, which he idly broke, and was surprised to find streaks showing gold. Macklan then broke a piece off an outcropping rock, which also had gold specks visible. He took out a miner's right and registered a prospecting area. A number of working miners, seeing Macklan in the registrar's office, paid the necessary fee to get access to the register, and at once set out for the locality of the discovery. On reaching the ground at daylight next day Macklan was surprised to see about 20 men camped near his claim. The news soon spread, and men came from all directions. It is supposed that the line of reef has now been pegged out for over two miles. There is a general exodus of working miners from Granya, who are now prospecting the locality of the new find. The stone obtained at the prospectors' claim is variously estimated to yield from 2 ounces to 7 ounces per ton. The site of the discovery is half a mile from the Tallangatta Valley State School, and is on private property. Very little work has yet been done by Macklan pending the arrangement of terms with the owner of the property, who has been communicated with.

## OUR CITY ARTICLE.

FRIDAY EVENING.

### THE MINING MARKET.

A week of idleness.—Prices fairly firm, but business dull.—Aladdin's and De Beer's fluctuating.—Improvement late in the week.

FOR the greater part of the week the Mining Market has been in that nervous and depressed condition invariably consequent upon a holiday, and it was not until the closing hours of Thursday that any indication of a recovery was noticeable. No cause likely to be permanent have contributed to the general languor. The humour of the market has been of that inconsequential, groundless sort, which in an individual would be expressively, if vulgarly, conveyed by a four-lettered word generally associated with "the ship of the desert." Both markets reopened on Tuesday with no disposition to serious business. One or two operations of a trifling character did not affect the general stability of prices. Saturday's level of values was everywhere maintained among shares of importance, excepting where, as with De Beers and Aladdin's, special circumstances made for a fall. With De Beers the withdrawal of support in Paris overbalancing favourable influences here sent the price down to 17. Whatever alterations there were in gold shares did not exceed for the most part 1-16. Most of the Indian shares were firmer, there being quite a run upon Gold Fields of Mysore in view of the new issue. The depression overspreading the mining market deepened into a gloom throughout Wednesday. Flatness and weakness prevailing generally in the house wrought its inevitable effect in both departments. Reactions were general, but not extensive, testifying to the unreality of the causes producing them. Simmer and Jack, Jagersfontein, and Rio Tinto recorded the largest falls of 5-16, 7-16, and 1-4 respectively. A somewhat disappointing return set back Aladdin, but the weakness is not expected to be of a permanent character. The exhaustion of a level of rich ore, though sufficient in a time of languor to produce a fall, can hardly have a permanent effect upon the value of the shares. Early on Thursday there was little indication that the hope, widely watered, of an improved market tone would be realised. During the day, however, confidence being regained in other quarters of the house, both branches of the Mining Market improved in sympathy. At the close of the day prices were in most cases some way above the lowest, and in more than one instance

there was a distinct betterment. Chartered, which had been vacillating dubiously all the week, rose nearly to 33s. and closed buyers. Consolidated Gold Fields, Bechuanaland Exploration, Diamond Shares, and New Primrose, with many other shares, became much more buoyant. There was still dullness in the miscellaneous quarter, but Indians were much better, the advance being general and marked. Rio Tinto also improved 1-4 as the favourable result of Paris buying.

African Consolidated Land shares have been bought upon the arrival of the company's manager at the Cape, and in the confident anticipation that important news will shortly be received from the property. The price closes with a firm tendency at 2s. 9d. to 3s.

#### British Mines.

The Cornish market has experienced a very quiet week, and the tone, on the whole, has been rather dull, owing chiefly to the fall in tin. Dolcoaths have been freely dealt in between 71 and 73½, and close steady about 72. East Pools are lower at 10½ sellers. Killifreth are quiet at 3 3-16. South Frances are weaker at 25s. The mine, however, is doing fairly well, and a favourable report was presented at the meeting yesterday. Tincofts are offered at 13. West Kitty are easier at 6½. Grenvilles are not quite so firm, and a few have been offered at 18½, but there is still a limited market for them.—Risen: Dolcoath, 40s.—Fallen: Carn Brea, 5s.; Cook's Kitchen, 5s.; East Pool, 5s.; Killifreth, 2s. 6d.; Phoenix, 2s.; South Crofty, 5s.; South Frances, 2s. 6d.; Tincoft, 5s.; West Frances, 7s. 6d.; West Kitty, 2s. 6d.; Wheal Agar, 5s.; and Wheal Grenville, 20s.

#### South African Shares.

There was little business doing in the South African market after the holidays, but prices remained pretty firm. The one feature of the day was the decline in De Beers, consequent upon sales from Paris. This downward tendency was not effectually counter-balanced by the support given to the shares upon this side, and they consequently declined 1-4, carrying New Jagersfontein down in sympathy. No movements of any importance took place in gold shares. Langlaagte Estate were in some demand, but closed unaltered. Langlaagte Royal at 27-16, City and Suburban at 13 5-16, and New Rietfontein at 1½ were asked for and rose 1-16. New Chimes participated in the upward movement, being 1-32 better at 2 5-32, and a demand for Sheba raised the price 6d. to 28s. On the other hand, New Heriot experienced a temporary set-back at 3 25-32, Kleinfontein fell to 19-16, and Crosses left off at 1½, all three being the turn weaker; and New Primrose experienced a small loss, finishing at 4 3-16. Land shares were very quiet. Chartered fell 3d. to 33s. 3d., while Johannesburg Estate were 6d. lower. For no assignable reason, but in keeping with the general depression in all parts of the house, a cloud hung over the South African market on Wednesday. A number of unfortunate downward movements in other directions exerted an extremely unfavourable influence upon prices, which were generally lower. Chartered and Bechuanaland finished 1-4 worse on the day, after numerous fluctuations. Oceansa receded to 1 15-16, Central Africans to 4s. 3d., Zambesia to 2 15-16, Explorings to 4½, Consolidated Gold Fields to 2 5-16. The debenture conversion scheme unfavourably affected De Beers, and they afterwards relapsed to 16½. Jagers were conspicuous for their weakness, and at the finish were as low as 15½. Business in Randshares was almost at a standstill, both buyers and sellers being very scarce. Langlaagte Royal rose 1-4 to 29-16, and advances of 1-32 or 1-16 were registered in Ferreira, Geldenhuis Estate, Heriot, Transvaal Gold, George and May, and United Roodepoort. Cities, Crownes, Darbans, and a few other leading stocks remained unaltered, but Simmer fell 5-16 to 5 11-16, the advantage derived from the amalgamation scheme having given way, and there were slight declines in Meyer and Charlton, Rietfontein, Primrose, Village, Wemmer, Salisbury, Robinson, and a few more. The announcement of a yield of 3600 ounces for April occasioned a demand for Champ d'Or. Aladdin's had a nasty tumble, owing to a decrease in the monthly return. Some well-advised individuals, however, think the depression unduly great. There was no improvement noticeable in South Africans at the opening on Thursday morning, but later in the day confidence reasserted itself, in sympathy with a marked improvement all over the house. At the finish prices were above the low water mark, and one or two advances were registered. Chartered rose to 32s. 10½d. in the street, and to 33s. in the house, where they left off, buyers. Hopeful rallies also took place in Consolidated Gold Fields and Bechuanaland Exploration. The proposal to increase the capital of the Oceansa Company was not favourably regarded, and the shares continued to droop. Among the shares which participated in the general improvement were African Consolidated, Gold Recovery, Aladdin's, and Wentworth. Among gold shares declines were still observable in Crown Reef and Wolhuter, the former being down 1-4 to 9 1-16, and the latter 3-32 to 2 31-32. City and Suburban and Simmer and Jack each fell 1-16, and Glencairn dropped 1s. to 31s. 6d., on the issue of 25,000 new shares. Knight lost 1s. to 14s. 6d., and smaller relapses were shown in Langlaagte, New Clewer Estate, Worcester, and Van Ryn. East Rand closed easier at 11½, and Alexandra Estate and Block B were still off colour and slightly lower. On the contrary, the recovery was noticeable in New Primrose, which closed 1-4 up at 4 3-16. Village Main Reef and Wemmer were 1-16 higher, and a better tone also exhibited itself in Sheba, May Deep Level, and Crosses. To-day the improvement has continued, and a more buoyant tone prevails all round. Chartered continued to rise and eventually reached 35s. Oceansa also improved, Risen: African Gold Recovery, 1s. 3d.; Bantjes, 6d.; Bechuanaland Exploration, 61.; Buffelsdoorn, 1s.; Champ d'Or, 1s. 3d.; Chartered, 2s.; Exploring, 5s.; Geldenhuis Estate, 5s.; Langlaagte, 2s. 6d.; ditto Royal, 5s.; May Deep, 2s. 6d.; Modderfontein, 1s.; New Chimes, 2s. 6d.; Nyassa, 1s. 3d.; Rand Mining, 5s.; Sheba, 1s.; United Roodepoort, 1s. 3d.; Fallen: Black Reef, 1s.; Block B, 6d.; Booyens Land, 1s.; Consolidated Gold Fields, 1s. 3d.; De Beers, 7s. 6d.; East Rand, 1s.; Edwin Bray, 6d.; Geldenhuis Main Reef, 6d.; Glencairn, 1s.; Johannesburg Estate, 1s.; Luipaard's Vlei, 1s.; Main Reef, 1s. 3d.; New Crosses, 1s. 3d.; New Jagersfontein, 10s.; Oceansa, 2s. 6d.; Potchefstroom, 6d.; Princess Estate, 1s.; Randfontein, 6d.; Robinson, 2s. 6d.; Siliati, 6d.; Simmer and Jack, 7s. 6d.; Spies Bona, 1s. 3d.; Stanhope, 2s. 6d.; South African Gold Trust, 6d.; Southern Land, 15s. paid, 6d.; Transvaal Consolidated, 6d.; Village Main Reef, 2s. 6d.; Witwatersrandt (Knight's), 1s.; Worcester, 2s. 6d.; St. Augustin, 6d.

#### Indian and Miscellaneous Shares.

Immediately after the holidays there was a general though unimportant fall in some of the lower priced miscellaneous shares owing to the lack of public support. Australian Broken Hill Consols and Waihi improved upon the news received from the proprietors. Broken Hill Proprietary fell 6d. to 51s. 6d., and the return from the New Queen property occasioned selling at a loss or 6d. Aladdin's Lamp left off 5-16 worse at 1½, and Elkhorn were 6d. easier at 12s.; while St. John del Rey and Craven's Caledonia each improved 6d. There was generally a better tone amongst Indian shares, Champion Reef, Oregum Ordinary, and Oregum Preference being 1-16 up, and Mysore Gold Fields and Balaghat 6d. Rio Tinto, at 14½, showed an improvement of 1-16, while other copper shares were unaltered. Wednesday brought little animation into the Indian and miscellaneous department. There were few buyers, and these were easily satiated. The deepening of the silver depression weakened the market for Broken Hill Props., while the selling of De Lamars was only present by the complete absence of anything like a demand for them. Recessions took place in New Queen, Mosman, Bonnie Dundee, and Day Dawn Block. Weakness was also displayed by Gravel Gold, East Kootenay, Montana, and Caratal. Craven's Caledonia, on the other hand, got better, while Idaho improved on the prospect of a judicious move on the part of the directors. The miscellaneous departments continued in many cases to be weak throughout Thursday. Oregum Ordinary and Preference, Nundydroog, and Mysore Gold were also somewhat depressed, although the losses did not exceed 1-16. St. John del Rey fell 6d. to 22s. 6d., and De Lamar 6d. to 15s. 6d. Broken Hill Proprietary, however, improved nearly 1s. to 219-32. Mysore Reefs were again bid for, and rose to 11s. and

New Queen, British Broken Hill, and South-East Mysore hardened the turn. Linares recovered 1-4 to 3½, and Rio Tinto on Paris buying, recovered 1-4 to 14½. The better tone noticeable to-day in the South African market has not been so marked in the Indian and Miscellaneous shares, which have continued to be rather flat, and have presented no features of interest.—Risen: Brilliant St. George, 2s.; Craven's Caledonia, 6d.; Frontino, 1s.; Golden Feather, 1s. 6d.; Gold Fields of Mysore, 6d.; Linares, 2s. 6d.; Mount Morgan, 1s. 6d. (allowing for dividend); New Guston, 5s.; Poorman, 2s. 6d.; Quebrada, 2s. 6d.; Waihi Gold, 3s. 9d.—Fallen: Achilles, 2s. 6d.; Aladdin's Lamp, 7s. 6d.; Broken Hill Proprietary, 1s. 3d.; Champion Reef, 1s. 3d.; Colombian Hydraulic, 6d.; Copiapo, 2s. 6d.; Da Lamar, 1s.; Eaglehawk, 6d.; East Kootenay, 6d.; Gravel Gold, 6d.; Harquahala, 1s.; Mason and Barry, 2s. 6d.; Mysore, 1s. 3d.; ditto, Harnhall, 6d.; New Queen, 9d.; Oregum Ordinary, 1s. 3d.; ditto, Preference, 1s. 3d.; Ripanji, 1s.; Rio Tinto, 2s. 6d.; Tolima A. Ss.; Wentworth Ordinary, 6d.

#### SETTLING DAYS.

(Ticket Days.) MAY. (Account Days.)  
Tuesday, May 29. Wednesday, May 30.

Wednesday, June 13. Thursday, June 14.  
Wednesday, June 27. Thursday, June 28.

#### CONSOLS SETTLING DAY.

Friday, June 1.

## MINING NOTES.

### HOME, COLONIAL, AND FOREIGN.

A GENTLEMAN who has returned from an inspection of the Nillinghoo claims, supplies the following information to the *South Australian Register*:—"The chief property known as Kirkeet's Treasure (so named by the Inspector of Mines) is an excellent show. I visited No. 2 pit, from which assays made by the Inspector of Mines averaged 3 ounces 1 dwt. 12 grains per ton, and to my astonishment I found an enormous lode measuring 19 feet, and am not sure the walls of the lode have been met with yet. From any portion of the lode by pitting or mortar good results can be obtained. The owners of the property appeared very anxious that I should obtain every information regarding it, and at the same time offered me any stone I wished for assay purposes, remarking:—'You may take in any quantity, even up to 5 tons if you require it, for testing by machinery.' No. 1 pit is being opened up, and gave an average of 7 dwts. 8 grains per ton. The lode here appears even more solid than in No. 2 pit, and shows gold to the naked eye, being about 100 yards (from No. 2 pit. No. 3 being the centre pit, which gave an average assay of 8 dwts. 12 grains, will, I understand, be opened up shortly. This also contains the same class of ore. The enormous width of lode and its assay of 1 ounce 3 dwts. makes it, to my opinion, a most valuable discovery. Joining the Eastern Block Syndicate are four blocks secured by Mr. Sudholz, who was most favourably impressed after his inspection."

NEXT to Western Syndicate are four 20-acre blocks held by the Look-Out Hill Syndicate, chiefly station hands. No. 1 block contains a vertical shaft to a depth of 60 feet, and driven into the hill to the extent of 20 feet, but it is anticipated that fully 40 feet more must be driven to cut the lode. At No. 3 block men are costeaning on the slope of the hill to pick up the lode. Some very nice stone had just been struck, showing gold. In a small creek a few feet east from where the men are costeaning I was shown holes where Kirkeet has discovered several ounces of good rough gold, say, from 5 grains to 9 dwts. The next claims west, called Look-Out Hill's Extended, is also being worked by a strong syndicate, and consists of 40 acres. Continuing westward along the line of reef are several claims secured by Mr. Cookman, the owner of Nillinghoo station, and which, I believe, are being formed into a strong syndicate. Several blocks to cut the underlie from this reef are also secured, including one 20-acre block taken up by the owners of Kirkeet's Treasure, situated on the southern boundary of this popular reward claim. Adjoining his northern boundary Kirkeet has also secured 20 acres, having discovered thereon a new line of reef carrying good gold. At a distance of about 2 miles east of Sudholz's claims are several claims pegged out. From the eastern blocks to the Look-Out Extended properties the identical formation characterises the whole line, and may extend much further when explored.

THE following is a synopsis of the report of Mr. John McGair, Mine Inspector, of the Eighth Anthracite District, U.S.A.:—"Table of production of the Eighth District for the year 1893 compared with 1892:—

	Tons, 1892.	Tons, 1893.
Coal shipped by rail.....	2,892,540	2,983,019
Coal used at mines.....	173,552	194,990
Total production.....	3,066,092	3,178,009

This shows an increased production for 1893 of 111,917 tons and an increased shipment over 1892 of 90,419 tons. In order to get out this quantity of coal 50,455 kegs of powder and 213,176 lbs of high explosives were used. There were 10,677 men and boys employed at 42 collieries, and an average number of 208 days were worked. The Lincoln colliery heads the list with the largest shipment, which was 359,114 tons. During the year there were 27 fatal accidents as compared with 50 for 1892. In 1893 there were 44 non-fatal accidents, in 1892 there were 52. In 1893 the quantity of coal mined per life lost was 117,704 tons, and the quantity per person injured was 72,227 tons. The ratio of employees per life lost in 1892 was 212, and in 1893, 395. Tons of coal mined per each employee in 1892 was 204 3-10 tons, and in 1893 it was 297 6-10 tons. The 10,677 men and boys employed in 1893 are classified as follows:—Inside foremen, 112; miners, 2773; miners/labourers, 1011; all company men, 1965; drivers and runners, 423; door boys and helpers, 166; total employed inside, 6440. Outside foremen, 47; blacksmiths and carpenters, 285; engineers and firemen, 300; slate pickers, 1751; all other company employees, 1700; superintendents, book-keepers, and clerks, 48; total outside, 4230.

THE African Gold Recovery Company (Limited) announce that 49,000 ounces of gold have been recovered at the Randt, and 7500 ounces in other districts, total 56,500 ounces during April, by means of their MacArthur-Forrest cyanide process, being 29 per cent. of the Randt output for April.

THE returns for the output of coal for Queensland during the year 1893 are now complete. The quantities are as follows:—

	Tons.
Inswich.....	202,429
Wide Bay.....	54,075
Clermont.....	7,879
Total output.....	264,383

The total output for the year 1892 was 265,086 tons, showing a decrease for the year of 703 tons. The value of coal mines in 1893, however, was £125,340, as against £125,803 in 1892, showing a money gain of £2032 for the past year. The coal output for Queensland fluctuated very little during the period from 1891 to 1893, and the colony does not more than produce sufficient coal for local consumption.

SINCE the adoption of the cyanide process in the De Knap district 21,599 ounces of gold have been obtained by its means up to the end of last March. Of these 28,794 ounces were obtained from tailings from the Sheba Mine, 1511 ounces from the Barrett's Barlyp, 1907 ounces from the United Ivy Reef, and 77 ounces from the Oceansa stream.



# A GOLD RUSH IN NEW MEXICO.

## Mining Camps and Mushroom Cities.

THE great Baron Humboldt, in examining and studying the immense porphyritic ranges of mountains that lie about 25 miles west of Santa Fé, New Mexico, said:—"Here is the great gold treasure vault of Nature." Professor Rosster Raymond, after a thorough and full examination of the Ortiz land grant, which also lies in this section, estimated the enormous sum of £100,000,000 gold in the placers alone, independent of the wealth contained in the great fissures that traverse this famed country on a northerly and southerly course. What these two great scientists have written and said about this gold district is now being verified by the pick and drill of the practical miner and prospector. If the reports which have been received concerning these gold discoveries in the Cochiti district of Santa Anna County, New Mexico, are not very much exaggerated, says the *New York Weekly Times*, the finds which, it is said, have been made will have an important bearing upon the financial situation in all sections of the country. Few of the thousands who have gone to the new gold fields have returned, but these few say that not since the wonderful boom in Leadville in 1879 has there been so much excitement in the district just opened, and a recurrence of the scenes incident to a mining camp of 40,000 men mad with the rush for gold is said to be taking place in Cochiti, which is within 30 miles of Santa Fé.

## Indians' Mysterious Wealth.

For 100 years it has been known that gold existed in this region, and it was also here that the far-famed secret silver mines of the Apache Indians were situated. It has also been known that for nearly a century a certain class of half-breed Mexicans, who have lived on the outskirts of the Cochiti district, have always been able to secure what they wished for their simple existence by paying for it in pure gold. The secret of the mine in which this precious metal was obtained was, however, carefully kept. For many years legends of Indian gold mines have been rife in the far West, and occasionally expeditions have gone out to locate them, but without success. Last November Samuel Allerton, the millionaire pork-packer of Chicago, sent a band of prospectors to the Cochiti district. The report made to Mr. Allerton convinced him that a development of the country would return rich results. With the view of securing the valuable portion of this new-found district, he last month sent a number of representatives to the Jememez Mountains, in the Cochiti district, who surveyed and filed claims to a tract including about 1000 acres. It was found by these surveyors that there were two old land grants, known as the Canada de Cochiti, and Pueblo de Cochiti grants. The section claimed by Mr. Allerton lies between these two grants on the west bank of the Rio Grande del Norte, in the foothills of the Rocky Mountains. It was also discovered that a section of land about 1 mile wide by 7 miles long, in this district, was unsurveyed Government land. Mr. Allerton and a few other capitalists have gone to work in the most energetic manner to develop this rich country.

## "Cities" Built in a Week.

Within a week of the opening of the Allerton claims there was a substantial city, with over 1000 inhabitants, where a few days before there were only sterile rocks and bare hillsides. This town was named Allerton, after its founder, and now has a population of over 3000. Another city of mushroom growth has also been built, and is known as Eagle City. It is situated in Pino Canon, and promises already to rival its sister city of Allerton. A meeting of Eagle City citizens was held a short time ago, and a petition was signed asking the Federal Government to establish in the town a regular post-office. The citizens also decided to turn out in a body and build a transportation road into their district. These two towns, or cities, as they call themselves, are typical of the frontier and of a newly-organised mining camp. They are surrounded on all sides by the white tents of the miners, which dot the hillsides and valleys, and the busy sound of the pick reverberates from the canon walls from sunrise to dark. About one hundred would-be millionaires are arriving at these towns every day, and it is expected that when the full facts regarding the richness of the rocks, which are seams with veins of gold, is known, there will be a mad rush of at least 50,000 men from all parts of the country to take up claims in Cochiti.

## Barren, but Rich.

It is a very desolate country which presents itself to the Cochiti traveller, one that offers no rest or variety to the eye, yet under foot the auriferous rocks hide untold millions. The gold-bearing ledges crop up continually between the primary and igneous rock, and are in some places 30 feet wide. Not only are there rich veins of gold-bearing quartz, but also placer gravel, which abounds in pinhead, shot, and small nugget gold, which can be washed out with a pan. In fact, almost anywhere in this district one can not only "pan" colours, but can "ring" a pan with the precious yellow metal. All who have visited the district predict that it will yield the most valuable gold deposits ever found. The first authentic news received from the Cochiti gold fields in New York was brought by a mining expert a few days ago. This gentleman says that hundreds of claims are being taken up as fast as possible, and even from the superficial holes already sunk in many of these claims there has been taken ore which assays from \$8000 to \$15,000 a ton in gold and silver. "There is no doubt about the richness of this field," said this gentleman. "The remarkable find already made may not be greatly surpassed, but miles of territory which has not been as yet even scratched are sure to yield equally good results, and I am sure that when the contracts are opened up the product in gold will surpass the richest fields of California and Australia."

## Pushing on New Railways.

Although there are no railroads as yet leading to this district, there are already two branches being built as rapidly as possible. One of these will be from Santa Fé, 30 miles east of Allerton, while the other one will be a branch from Espanola, the southernmost station reached by the Rio Grande Railroad. This latter road, as projected, will cut directly through the new mining district, and will form an outlet for the tons of ore shipped to smelters. At present long lines of pack-laden burros wind through the foot hills to Allerton from Santa Fé, for every article of merchandise and food has to be carried for 30 miles on the backs of these patient beasts. Returning, they transport the rich gold-bearing ore in rude leather sacks to the smelting works. Each band of burros, with its treasures, is guarded by men armed to the teeth, who would grant short shift to any man or body of men who attempted to seize the gold sacks. Although the rich district of Cochiti has only been recently discovered, yet in Taos county to the north there are already being systematically developed the mixed copper, silver, and gold mines which were located a few months ago. In these finds the copper takes the shape of wood petrifications, due to the percolation of copper solutions. These petrifications contain 86 per cent. of copper carbonate. While the country is peculiarly bare of trees, the water facilities are excellent, and several irrigation companies of the Cochiti have already been organised to supply, at a reasonable rate, the miners whose claims are at a distance from the streams which intersect the mountains. Another source of water supply is from artesian wells, which are scattered through the valley.

## The Rush.

The rush to this new country is already assuming such tremendous proportions that many towns within a radius of 800 miles are rapidly being depopulated of their male inhabitants. The mining fever has swept over Santa Fé, and a whirlwind of speculation has devastated the routine business interests of that old Spanish-built city. It is probable that the opening of this rich mining district will do much towards relieving the Western States of their surplus labour. The thousands of expert miners who have recently been thrown out of work by the closing of the silver mines are already tramping towards the Cochiti district from all directions.

# LATEST FROM THE MINES.

## CABLEGRAMS AND TELEGRAMS.

**LADDIN'S LAMP.**—The following cablegram has been received from the mine:—"During the past four weeks we have crushed 300 tons of ore which have yielded 515 ounces of gold. We have worked out the rich ore in the stopes over the 300 feet level, and in future shall have to depend on the lower levels for rich ore. There is a large body of low grade ore existing in the upper workings, which can be worked to better advantage by the new machinery and ball mill."

**AUSTRALIAN BROKEN HILL CONSOLS.**—The following telegram has been received from the general manager, dated Broken Hill, May 12:—"280 level east prospecting drive main shaft, block 96, the vein is looking promising; 8 cwt., 2500 ounces silver."

**BAYLEY'S REWARD.**—The following cablegram dated 17th inst. has been received from Melbourne, by this company's London office:—"The week's yield has been 630 ounces. Shall be working with 10 stamps. Sufficient water. May dividend 4d. per share, payable May 28."

**BRILLIANT BLOCK.**—The directors have received the following cablegram from Charters Towers:—"Have crushed during the fortnight 782 tons of quartz for 1121 ounces of gold." The approximate value of this return is £3865.

**CROWN REEF.**—Results for April, 1894, received by cablegram from Johannesburg, S.A.R.:—"Number of days working 120 stamp mill, 27 days 14 hours; crushed by 120 stamp mill, 16,554 tons; accumulated tailings and slimes treated, 9825 tons; yield in smelted gold from 120 stamp mill, 7344 ounces; yield in smelted gold from cyanide works, 2890 ounces; yield in smelted gold from old cyanide works, 1819 ounces; total 12,053 ounces. 120 stamp mill and cyanide works, 16,554 tons milled; accumulated tailings and slimes, 9825 tons treated. Revenue per ton treated, 12s. 1-04d.; cost per ton treated, 6s. 10-70d.; profit per ton treated, 5s. 2-34d. Profit from 120 stamp mill and cyanide works, £11,808; profit from accumulated tailings and slimes, £2500; total profit for April, £14,308."

**DON PEDRO.**—The directors have received the following telegram, dated Mariama, May 12:—"Remitting 2069 oits. (= 238 ounces) April produce. Reduction closed; stowing mineral; 60 cross cut opening well; rise new lode passing through good mineral; arranging sinking; preparing resume adit; prospects favourable."

**EL CALLAO.**—Messrs. Baring Brothers and Co. (Limited) have received the following telegram:—"676-700 ounces of gold produced by El Callao Mine for past fortnight; and 976-1000 ounces by the Colombia Mine."

**FRONTINO AND BOLIVIA.**—The directors have received advices from the mines for the month of March:—"Produce, value £7107 16s. 6d.; cost, £4628 16s.; estimated excess of returns, £2481 0s. 6d."

**GOLDEN GATE.**—The manager cables:—"The present depth of the bore from the surface is 830 feet. The rock passed through is hard syenitic granite."

**HOLCOMB VALLEY.**—The board have received a cable indicating that since the weather permitted, the resumption of work a test run of 870 cubic yards has been made, which gave a clean up of £75 equal to 1s. 8½d. per cubic yard. They are advised by the latest mail that, pending a small alteration in the machinery, there is a loss of something like 22 cents per cubic yard of gravel, as shown by assays of the tailings. This would indicate that the gravel is worth something like 2s. 7d. per cubic yard, or 1s. 1d. better than the original estimate of 1s. 6d. per cubic yard.

**JAY HAWK AND LONE PINE.**—The directors have received the following telegram from the manager:—"Mill returns 5300 ounces for four days. Mill now running full time. Bonanza shaft assay 40 ounces to 45 ounces per ton. Lone Pine Mine 1500 feet level ore continues very good."

**JOHANNESBURG PIONEER.**—Output for April, 751 ounces of gold.

**KABOONGA.**—The following cablegram has been received from the manager at the mine:—"Borings in the face of south-east drive at 102 feet show pipe clay. Rise 22 feet very near lead. Rise in south-west drive 63 feet. Both rises going up 70 feet."

**KAPANGA.**—The directors have received the following telegram from the manager:—"I expect to complete plunger pumps to-morrow. Resume sinking next week. Comorandel: Lode opening up well, good ore is still being found, sufficiently important to warrant the erection of engine. Have sent full particulars by letter."

**LAS CABESSES MANGANESE MINES.**—Production for the week ending May 12 (six working days) 423 tons, being a daily average of 70½ tons.

**MILL'S DAY DAWN UNITED.**—Return for the four weeks ending May 12:—"Tons crushed, 3580; ounces of gold obtained, 3684; approximate value, £12,640; dividend, 6d. per share."

**MODDERFONTEIN.**—During March 20 stamps working 28 days crushed 1668 tons, yielding 1923 ounces of gold. Profit, £2656 12s.

**NEW DOURO (Portugal).**—Small mill started, first clean up. Milled 227 tons ore, gold recovered 123 ounces.

**NEW GUSTON.**—The following cable information has been received from Mr. Fred P. Crowther, director, who is at present at the mine:—"The mine looks exceedingly well. The ore is improving as developed. Ore reserves have been largely increased by recent developments. Considerable quantity of bornite (argenterous copper ore) in the lower levels, assaying 20 to 40 per cent. of copper, and over 200 ounces of silver per ton. Also a large quantity of yellow copper ore, assaying 10 to 14 per cent. of copper, half to one ounce gold, 30 to 70 ounces of silver per ton.—No. 11 level: The ore is 14 feet thick, still continues. Splendid body of ore."

**NEW QUEEN.**—The directors have received the following telegram, dated Charters Towers, May 12, giving result of crushing for past fortnight:—"290 tons, yielding 260 ounces gold; No. 4 formation 130 tons, yielding 157 ounces gold. Have shipped per s.s. *Devonshire* 840 ounces."

**OURO PRETO.**—The directors have received a cablegram from the mine, giving return for the month of April as follows:—"3029 tons produced 35,808 grammes = 1151 ounces."

**ROYAL SILVER MINES OF POTOSI.**—The secretary has received cable advice that "the production for April amounted to 25,900 ounces fine."

**TRANSVAAL COAL TRUST.**—The following is a copy of a cablegram which has been received from Johannesburg, with reference to this company's operations for April:—"Output, 23,100 tons; profit, £4150."

**TRUE BLUE BLOCK.**—The following telegram has been received:—"1000 tons have been crushed for a return of 2 ounces 10 dwts. per ton. Shares rising."

**TRUE BLUE 3 AND 4 SOUTH.**—The following telegram has been received:—"A dividend has been declared of 6d. per share."

**WAIHI.**—Billion return for 28 days ending May 5, £4500 from 1650 tons.

**WASSAU (Gold Coast).**—The produce of the mine for the month of March last reached £2000 19s., being 530 ounces standard, viz.:—433 ounces from regular ore and 87 ounces plate scrapings. The mill worked 27 days, and crushed 378 tons of ore, giving a yield of 1 ounce 8 dwts. standard per ton. Cablegrams have since been received, advising the remittances for last month as 378 ounces bullion; and a yield of 1 ounce 3 dwts. per ton.

# THE METAL MARKETS.

## LONDON METAL MARKET.

THE METAL MARKET—LONDON, MAY 18.

### Copper.

IN the G.M.B. market we have touched this week prices within a few shillings of the lowest on record, excepting those which immediately followed the failure of the French Syndicate, when £35 was accepted; but that was with statistics showing a total visible supply of about 125,000 tons against 40,000 tons to-day. As a general case, the lower the prices of the articles go, the more alarmed do the holders of long-standing become, and the more difficult it is to get new blood into it. This is the present position, and it accounts for the decline in the market. The statistics for first half of May show an improvement of over 500 tons, but this was without perceptible effect on the G.M.B. market. Speculative enquiry has been dull, and prices gave way on the opening day from £40 s.c. to £39 10s., whilst three months was done successively at £40 5s., £40 2s. 6d., £40, and £39 17s. 6d. Wednesday's business was at the lowest named, and was of only small extent, and on Thursday the moderate sales effected sufficed to depress the value to £39 7s. 6d. s.c., and £39 15s. three months. To-day about 750 tons changed hands at falling prices, £39 11s. 3d. three months being eventually reached, and about £39 2s. 6d. for s.c. The market closes dull with spot at £39 2s. 6d. to £39 5s., and three months at £39 11s. 3d. to £39 12s. 6d.

### Tin.

This article quite collapsed on the two opening days—i.e., Tuesday and Wednesday, chiefly in consequence of the lower silver values. The drop in Straits tin amounted to 30s. per ton—viz., from £72 s.c. on Tuesday morning to £70 10s. on Wednesday afternoon. The total turnover for the two days was only about 400 tons. On Thursday there was a rally to £70 15s. s.c. and to-day, after business at £71 10s. three months and £70 15s. s.c. The market closes steady at £70 15s. to £70 17s. 6d. s.c., and £71 7s. 6d. to £71 10s. three months. In the Dutch market there has been a decline in the value of Billiton tin from 43½ fl. s.c. to 42½ fl., at which the market closes.

### Pig Iron.

Scotch shipments last week were advised as 4402 tons—i.e., more than 1500 tons less than in the corresponding week of 1893. The Glasgow market this week has ranged from steady to flat, with values dropping first from 41s. 11½d. to 41s. 7d., recovering then to 41s. 9½d., and declining again to 41s. 7½d. To-day 41s. 6d. was done, the market closing at 41s. 6½d. sellers s.c., Scotch, with hematite at 43s. 9d., and Cleveland at 35s. 3½d.

### Lead.

There is no special feature to record. The business passing seems to be unimportant, and prices keep steady, with a trifle more firmness at the close. The closing quotation is £9 2s. 6d. for soft foreign and £9 3s. 9d. to £9 5s.

### Spelter.

closes a shade harder at £15 15s. ordinaries, and £15 17s. 6d. specials. is dull at £34.

### Antimony.

### Quicksilver.

continues steady at £6 firsts and £5 19 seconds.

The following are to-night's (May 18) prices of metals:—

	Copper.	£ s. d.	¢ s. d.
Tough cake and ingot	...	41 15 0	42 5 0
Best selected	...	42 15 0	43 5 0
Sheets and sheathing	...	50 10 0	51 10 0
Flat bottoms	...	53 10 0	54 10 0
Chill bars	...	39 2 6	39 11 3
Good merchantable, spot, & 3 months respectively	...	39 2 6	39 11 3
Copper tubes, seamless	...	—	0 0 7½
	Alloys.		
BRASS: Wire	...	—	0 0 5
" Tubes (solid drawn)	...	—	0 0 5½
" Sheets	...	—	0 0 5½
PROSPER BRONZE: Alloys II.	...	—	88 0 0
" " III. or V	...	—	95 0 0
" " XI.	...	—	90 0 0
" " Vulcan brand Al B.C.	...	80 0 0	85 0 0
DURO METAL	...	80 0 0	85 0 0
BULL'S METAL	...	—	70 0 0
	Ferrobronze (Vivian's).		
Ingots	...	0 0 5½	—
Ordinary sheets, plates, bolts and bars	...	0 0 6½	—
Screw bolts and nuts	...	0 0 8½	—
Pump rods, plain	...	0 0 7½	—
" finished	...	0 0 10½	73 10 0
DELTA METAL: No. 4 (per ton)	...	—	—
" Sheets and plates (per lb.)	...	0 0 10½	—
" Bars, round, square, flat (per lb.)	...	0 0 9½	—
" hexagonal (per lb.)	...	0 0 9	—
	Tin.		
English, ingots, f.o.b.	...	75 0 0	75 10 0
" bars	...	77 0 0	78 10 0
" refined	...	77 0 0	77 10 0
Straits, spot and 3 months respectively	...	75 15 0	71 7 6
Australian, spot, and three months respectively	...	71 2 6	71 15 0
Banco (in Holland)	...	78 0 0	75 2 6
Tin PLATES: Charcoal, best quality	...	per box	0 18 0
" ordinary	...	—	0 14 0
" Coke, best quality	...	0 11 3	0 11 9
" ordinary	...	—	0 10 0
These prices of tinplates are f.o.b. at Swansea: at Liverpool 6d. per doz more.			
	Iron.		
Fig. G.M.B. f.o.b. Clyde, spot	...	—	2 1 6
" Scotch pig, No. 1 Gartsherrie	...	—	2 11 0
" " Clydes	...	—	2 15 0
" " Govan	...	—	2 9 0
" " Wales	...	—	2 3 0
Bars, Welsh, f.o.b. Wales	...	—	5 2 6
Plates	...	—	6 0 0
Bars, Staffordshire, at works	...	—	5 7 6
Sheets	...	—	6 9 6
Plates	...	—	5 15 0
Hoops	...	—	4 18 0
Ship plates, Middlesbrough	...	—	20 0 0
Best: English spring	...	10 0 0	20 0 0
" cast	...	35 0 0	60 0 0
" Rails at works, according to section	...	3 12 8	5 5 0
	Lead.		
Spanish or soft foreign	...	—	9 1 6
English pig, common	...	9 3 8	9 5 0
" L.B.	...	—	10 2 6
" sheet and bar	...	—	10 12 6
" pipe	...	—	12 0 0
" red	...	—	18 0 0
" white	...	—	18 0 0
" patent shot	...	—	13 10 0
	Spelter.		
Silesian ordinary brands	...	—	15 15 0
" special brands	...	—	15 17 6
English Swansons	...	—	16 1 6
Sheet Zinc	...	18 10 0	18 15 0
	Antimony.		
Antimony	...	—	34 0 0
	Quicksilver.		
Flasks, 75 lbs. warrants	...	8 0 0	6 19 0
Ore, c.i.f. U.K. ports	...	—	per unit.
1st quality, 50 per cent. and upwards	...	0 0 10½	0 0 11½
2nd " 47 per cent. to 50 per cent.	...	0 0 8½	0 0 10½
3rd " 40 " 47 per cent.	...	0 0 6	0 0 10
99-99½ per cent. (guaranteed 99 per cent. min.) in ingots (1 cwt. size)	...	—	0 1 1
do	...	—	(3 cwt. and up) 0 1 1
99-99 per cent. guaranteed	...	—	0 1 7½
do	...	—	0 1 11



# "THE MINING JOURNAL" SHARE LIST.

**ABBREVIATIONS AND REFERENCES.**—The following are the significations of the abbreviations and references which occur in the Share List:—A, Antimony; A, Arsenic; B, Blende; Bz, Borax; C, Copper; D, Diamond; G, Gold; I, Iron; L, Lead; M, Manganese; N, Nitrate; P, Phosphate; Q, Quicksilver; R, Ruby; S, Silver; S-I, Silver-lead; Sul, Sulphur; T, Tin; and Z, Zinc. \* In the "called up" column of British Mines, signifies that the mine is conducted on "cost book" principles; † in the "Head Office" column of African Mines, signifies that the address given is not that of the head office, but of a sub- or transfer office; and ‡, following the names of African mines, signifies that they are subject to the Limited Liability Law of the South African Republic.

The following is by far the most complete and comprehensive list of mines, in whose shares business is being currently transacted, published. Additions will be made from time to time as occasion requires. Every effort is made to ensure accuracy, and the correctness of the list is guaranteed, and our readers are cordially invited to co-operate with us to this end, by notifying us of any errors that may at any time occur. We desire it to be understood that, while our Share List will almost invariably be found correct, we do not hold ourselves responsible for any loss or inconvenience that may arise from possible inaccuracies.

## BRITISH MINES.

Name.	Closing Price, May 18, 1894.	Closing Price, May 11, 1894.	Par.	Latest Dividend.	Called up Per Share.	Shares Issued.	Situation of Mine.	Head Office.
Atlas	—	—	1 0	—	1 0 0	12,000	Devon	Camborne.
Bine Mills	—	—	—	2/- May '81	5 9 8	5,353	Cornwall	Camborne.
Botallack	—	—	—	—	51 4 8	1,230	Cornwall	St. Just.
Carn Breas	10 1/2 11	11 1/2	—	2/6 Dec. '93	21 12 6	6,000	Cornwall	Carn Breas.
Cook's Kitchen	5/- 10/-	15/-	—	—	35 5 10	4,900	Cornwall	Camborne.
Cumberland	—	—	1 0	5 1/2 May '88	1 0 0	51,988	Cumberland	7, Angel-court E.C.
Derwentwater	—	—	1 0	—	1 0 0	10,560	Cumberland	Manchester.
Devon Gt. Cons.	20/- 25/-	22/6	6 0	3/- Nov. '93	2 0 0	10,240	Devon	3, Finsbury-circus.
Dolomath	71 73	71	—	12/6 Apr. '94	9 12 6	4,700	Cornwall	Camborne.
Drakewalls	—	—	5/-	—	0 2 0	61,856	Cornwall	Dashwood House.
East Grassington	—	—	1 0	—	1 0 0	19,905	Yorkshire	Palmerston-building
East Pool	10 1/2 10 1/2	11	—	2/- April '94	0 9 9	8,400	Yorkshire	Illogan.
Gawton	—	—	50/-	—	3 7 3	12,000	Devon	20, Great St. Helens.
Great Tazewell	1 1/2 2 1/2	2 1/2	4 0	5/- Apr. '92	4 0 0	15,000	Ile of Man	Douglas, Isle of Man.
Green Hurth	—	—	1 0	—/6 June '89	0 10 0	32,000	Cumberland	Newcastle.
Halkyn	—	—	1 0	2/- Sep. '93	1 0 0	10,000	Flintshire	Chester.
Hexworthy	—	—	1 0	—	1 0 0	14,634	Devon	6, Queen-street-place
Ile of Man	—	—	5 0	—	5 0 0	14,000	Ile of Man	Chester.
Killbreth	3 3 1/2	3 1/2	—	3/6 Dec. '93	5 11 8	6,000	Cornwall	Truro.
Kingside	—	—	1 0	3/- May, 1892	1 0 0	15,919	Cardiganshire	8, Queen-street-place
Lead Hills	17/6 22/6	22/6	6 0	3/- Sep. '92	8 0 0	20,000	Lanarkshire	30, Finsbury-circus.
Levant	—	—	5/-	—	11 9 6	2,500	Cornwall	Penzance.
Lovell	—	—	—	1/3 Nov. '91	1 10 7	7,165	Wendron	3, Gt. Queen-st. S.W.
Minera (New)	—	—	5 0	5/6 Mar. '90	5 0 0	9,000	Denbighshire	Minera, N. Wales.
North Wales	—	—	1 0	6 1/2 Feb. '91	0 18 0	24,885	Northumberland	Newcastle-on-Tyne.
New Ballalawade	—	—	1 0	—	10 10 3	4,900	Cornwall	St. Clement's Ho., E.C.
New Corns Hill	—	—	—	—	4 3 6	7,000	Cornwall	Redruth.
Pen-an-drea	—	—	—	—	10 10 3	4,900	Cornwall	Redruth.
Phenix United	3/- 5/-	7/-	—	1/- Mar. '90	4 3 6	10,658	Cornwall	Iskeard.
Polbarro	20/- 22/6	22/6	—	—	3 6 9	18,000	Cornwall	37, Walbrook.
Prince of Wales	2/- 3/-	3/-	10/-	—	0 8 3	94,287	Cornwall	6, Draper's-gardens.
So. Conduff	12/6 17/6	17/6	—	3/6 Apr. '93	7 12 7	6,123	Cornwall	20, Great St. Helens.
South Crofty	2 1/2 3 1/2	3 1/2	—	—	17 2 6	6,120	Cornwall	Pool, Cornwall.
S. Frances Unitd.	1 1/2 1 1/2	1 1/2	—	—	15 7 6	6,000	Cornwall	Redruth.
Thornhill	1 1/2 1 1/2	1 1/2	—	2/- Apr. '94	1 10 0	6,000	Cornwall	Redruth.
Weardale	1 1/2 1 1/2	1 1/2	4 0	1/3 Oct. '90	1 10 0	60,000	Durham	1, Lombard-court.
West France	2 1/2 3 1/2	3 1/2	—	2 1/2 May '93	15 17 1	6,144	Cornwall	Camborne.
West Kitty	2 1/2 3 1/2	3 1/2	—	4/- Jan. '94	0 12 0	6,000	Cornwall	37, Walbrook.
Wheel Agat	2 1/2 3 1/2	3 1/2	—	10/8 Aug. '88	23 5 2	6,000	Cornwall	Redruth.
Wheel Raset	2 1/2 3 1/2	3 1/2	—	2/- Apr. '94	12 5 0	6,144	Cornwall	Redruth.
Wheel Friendly	2 1/2 3 1/2	3 1/2	—	—	0 11 3	10,000	Cornwall	37, Walbrook, E.C.
Wheel Grenville	2 1/2 3 1/2	3 1/2	—	3/- Feb. '94	18 2 0	6,000	Cornwall	7, Union-court, E.C.
Wheel Killybeg	2 1/2 3 1/2	3 1/2	—	3/- Mar. '88	4 5 6	8,590	Cornwall	Truro.
Wheel Metal & F.	2 1/2 3 1/2	3 1/2	—	—	0 13 9	10,784	Cornwall	79 1/2, Gracechurch-st.

## NORTH AMERICAN MINES.

Name.	Closing Price, May 18, 1894	Closing Price, May 11, 1894.	Par.	Latest Dividend.	Called up per Share.	Shares Issued.	Situation of Mine.	Head Office.
Almaden and T...S	-/3 -/9	-/9	2/6	—	0 2 6	351,008	Mexico	6, Queen-street-place
American Belle...S	1/8 2/-	2/3	1 0	—/8 Mar. '91	1 0 0	400,000	Colorado	25A, Old Broad-street.
Big Ore	—	—	1 0	1/- Dec. '91	1 0 0	80,098	Nevada	2, Pansara-lane, E.C.
California	—	—	10/-	1/5 May '90	0 8 9	129,271	Colorado	St. George's Ho. E.C.
Canadian Phos. & Chl.	—	—	1 0	—/6 Nov. '90	1 0 0	73,334	Canada	155, Fenchurch-st.
Chilapax	—	—	1 0	—	1 0 0	221,876	Mexico	32, Broad-st. Av. E.C.
Colorado Silver...S	—	—	1 0	—	1 0 0	112,491	Colorado	Abchurch-chbrs. E.C.
Cortez	—	—	1 0	3 1/2 Feb. '93	1 0 0	300,000	Nevada	Suffolk House, E.C.
De Lamar.....GS	18/- 19/-	20/-	1 0	1/- April 94	1 0 0	400,000	Idaho	6, Draper's-gardens.
Dickens CusterGS	—	—	1 0	—	0 19 9	420,000	Idaho	Winchester Ho. E.C.
Elkhorn	12/- 13/-	12/8	1 0	-/9 Mar. '94	1 0 0	175,007	Montana	6, Draper's-gardens.
Emma	—/3 -/6	-/6	5 0	—	0 5 0	367,788	Utah	15, Geo-st. Mans. Ho.
Flagstaff	—/3 -/6	-/6	1 0	—	0 18 3	240,000	Utah	Dashwood Ho., E.C.
Garfield.....GS	—	—	1 0	-/8 Dec. '88	0 19 8	93,185	Nevada	Suffolk House, E.C.
Golden Feather G	9/- 10/-	8/6	1 0	—	1 0 0	180,000	California	8, Stephens Co. E.C.
Golden Gate	6/- 7/-	7/-	1 0	—	0 19 0	79,600	California	St. Stephens Co. E.C.
Golden Leaf	-/9 1/3	1/3	1 0	—	1 0 0	300,259	Montana	8, Draper's Gardens.
Golden Valley...G	—	—	1 0	—	1 0 0	55,507	Colorado	15, Angel Court
Harquahala.....G	15/- 16/-	16/-	1 0	-/6 Apr. '94	1 0 0	300,000	Arizona	6, Drap. St. Gardens.
Ho. Comb Valley G	1/- 1/3	1/3	5 0	-/8 Oct. '93	0 5 0	300,000	California	14, Cornhill E.C.
Idaho.....GS	1/8 1/9	1/9	1 0	—	0 4 8	143,439	Idaho	140, Le. dental-st.
Jackson Goldfields	—	—	5 0	—	0 5 0	403,835	Idaho	11, Drapers' Gardens.
Jay Hawk	6/6 7/8	7/8	1 0	-/8 Dec. '92	1 0 0	285,000	Montana	Dashwood House.
Kohinoor.....GS	—	—	1 0	1/- Dec. '91	1 0 0	112,901	Colorado	Blonfield Ho., E.C.
Koblenor	—	—	5/-	1/3 Oct. '92	0 4 3	405,000	Colorado	11, Poultry, E.C.
La Plata.....S	—	—	1 0	6c. ph. Mar. '94	1 0 0	575,000	Colorado	43, Thredneedle-st.
Maid of Erin	—	—	1 0	—	1 0 0	400,000	Final Arizona	257, Winchester St.
Mammoth Gold	-/6 1/-	—	1 0	—	5 0 0	10,000	Mexico	Dashwood Ho., E.C.
Meq. d'l Oro (P) G	3 1/2 3 1/2	3 1/2	5 0	—	5 0 0	10,000	Mexico	Dashwood Ho., E.C.
Meq. d'l Oro (D) G	3 1/2 3 1/2	3 1/2	5 0	—	5 0 0	10,000	Mexico	Dashwood Ho., E.C.
Montana	5/6 6/-	6/-	1 0	5 1/2 April '91	0 17 0	65,000	Colorado	Gresham House, E.C.
New Colorado	—	—	1 0	—	1 0 0	150,000	Idaho	Abchurch Chm. E.C.
N. Consolidated	—	—	1 0	—	0 19 9	191,045	N. Carolina	15, Angel-court, E.C.
N. Eberhardt.....S	—	—	5/-	—	0 19 9	191,045	N. Carolina	15, George-st., E.C.
N. Gold Hill.....S	—	—	1 0	—	1 0 0	110,000	Colorado	25A, Old Broad-st.
New Guston.....S	1/5 1/3	1/3	1 0	1/- Oct. '92	1 0 0	110,000	Colorado	55, Bishopst. St. W.
New London	—	—	2/6	—	337,816	New Carolina	Langthorne Ho., E.C.	
N. W. River Hill...G	—	—	10/-	—/9 Dec. '85	0 10 0	120,000	N. Carolina	11, Old Jewry Chm.
N. W. Vancouver	—	—	3/6	3 1/2 May '94	1 0 0	215,000	Brit. Columbia	4, Opthal-building.
Palmarero	1/3 1/6	1/6	1 0	—	1 0 0	150,000	Mexico	110, Cannon-street.
Pinos Altos (N)GS	6/6 7/8	7/8	1 0	-/8 Mar. '90	1 0 0	77,147	Nevada	Suffolk House, E.C.
Pittsburg Con. (N) G	—	—	1 0	1/6 Mar. '90	1 0 0	77,147	Nevada	Suffolk House, E.C.
Poorman Con.....S	8/6 9/8	9/8	5/-	—	0 5 0	273,948	Idaho	5, Opthal-bldg. E.C.
Red Mountain.....S	—	—	1 0	—	1 0 0	46,856	Colorado	11, Poultry, E.C.
Richmond.....GSL	1/5 1/3	1/3	5 0	1/- Sep. '93	5 0 0	54,000	Nevada	44, Coleman-street.
Ruby	—/6 1/-	—	5/-	—	0 5 0	211,371	Nevada	22 St. Mary Ave.
Santa Rita	8/- 10/-	9/6	2 0	-/8 Apr. '94	2 0 0	122,500	California	138, Leadenhall-st.
San Plumas Eur. G	2 1/2 2/9	2/9	8 1/2	16 1/2 Y. Dec. '92	8 1/2	1,000,000	Colorado	20, Abchurch Lane.
Springdale	—	—	1 0	—	1 0 0	908,654	Mexico	3, Gt. Winchester St.
United Mexican S	1/- 1/8	1/8	1 0	2/6 May '87	1 0 0	150,000	Idaho	Broad-st. House, E.C.
Viola (New).....	—	—	1 0	—	1 0 0	150,000	Idaho	Broad-st. House, E.C.

## SOUTH AND CENTRAL AMERICAN MINES.

Antio. (Pref.) G.S.	—	—	1 0	-/8 Mar. '90	1 0 0	22,823	Colombia	184, Gresham House
Antioquia (ordly)	—	—	1 0	—	1 0 0	41,453	Colombia	184, Gresham House
Callao Bie.	-/9 1/-	1/-	1 0	—	1 0 0	316,245	Venezuela	50, Old Broad-street.
Camarones	—	—	2 0	—	0 2 0	67,000	Chili	123, Bishopsgt. Wn.
Caralito	-/5 -/7	-/7 1/2	2 0	—	0 2 6	1,330,000	Venezuela	57, Moorgate-st. E.C.
Colon	-/9 1/-	1/-	1 0	—	1 0 0	200,000	Colombia	5, Cophthal-bldg., E.C.
Colorado Nit.	3 3 1/2	3 1/2	5 0	7/5 May, '89	5 0 0	32,000	Chili	12, King-st., Liverpl.
Colombian Hy. G.	15/- 16/-	16/6	1 0	1/- April '94	1 0 0	75,000	Colombia	10, Blomfield-street.
Conchipo	15/6 17/6	17/6	2 0	2/- Dec. '93	1 0 0	100,000	Chili	Dashwood House, E.C.
Darien	2/- 3/-	3/-	1 0	—	1 0 0	71,359	Colombia	Manchester.
Don Pedro	2/3 2/6	2/6	1 0	—	1 0 0	133,102	Brazil	24-5, Devonsh. Co. E.C.
El Callao	3 1/2 3 1/2	3 1/2	5 0	2 fro. Nov. '90	5 0 0	257,800	Venezuela	8, Bishopsgt.-st. Wn.
Frontino & B. G.	15/6 15/6	21/6	1 0	1/8 Dec. '93	0 18 6	128,682	Colombia	184, Gresham House.
Glenrock	1/9 2/3	2/3	1 0	—	0 18 6	199,948	Argen. (& Ind)	3-5, Queen-street, E.C.
Glenrock (Pref.)	—	—	1 0	—	0 18 0	16,332	Argen. (& Ind)	3-5, Queen-street, E.C.
Gravel	6/- 6/6	7/6	1 0	—	0 19 6	100,000	Colombia	10, Blomfield-street.
Javali	—	—	3/-	8 1/2 % '91	0 2 0	105,234	Nicaragua	139, Cannon-street.
Julia Nit.	4/6 5/-	5/-	5 0	—	5 0 0	30,000	Chili	79 1/2, Gracechurch-st.
Lautaro	4 1/2 4 1/2	4 1/2	5 0	5/- Jan., '94	5 0 0	55,000	Chili	70, Gracechurch-st.
Liverpool	—/9 1/3	1/3	1 0	10/- Feb. '94	8 0 0	22,000	Chili	Liverpool.
Loma	-/9 1/3	1/3	1 0	—	1 0 0	300,000	Colombia	5, Cophthal-building.
London Nit.	—	—	3 0	3 1/2 % Nov. '89	5 0 0	10,000	Chili	9, Gracechurch-st.
London Nit. (Pref.)	—	—	5 0	5/- May, '94	0 1 0	22,000	Chili	9, Gracechurch-st.
Mazda	2/- 3/-	3/-	2/-	—	0 1 0	—	Peru	11, Old Broad-st. E.C.
Ouro	2/- 2/6	2/6	1 0	1/- April '89	1 0 0	30,000	Colombia	10, Blomfield-street.
Orta Preto	—	—	1 0	—	0 18 6	80,000	Brazil	6, Queen-street-place
Panulillo	—	—	2 0	1/- Nov. '89	2 0 0	112,500	Chili	13, Great St. Helens
Primitiva	3 1/2 4	4 1/2	5 0	9 1/2 % Oct. '89	5 0 0	40,000	Chili	Liverpool.
Quebrada	4 1/2 4 1/2	4 1/2	5 0	5 1/2 % Mar. '92	5 0 0	241,956	Venezuela	38, N'cholas Lane.
Rosario	4 1/2 4 1/2	4 1/2	5 0	5 1/2 % Feb. '94	5 0 0	120,000	Chili	57 1/2, Old Broad-street.
Rosario (5 1/2 Deb.)	27/- 23/-	23/-	100	10 1/2 % June '82	1 0 0	4,750	Brazil	28, Tower-chmbrs., E.C.
St. John del Rey	1 1/2 1 1/2	2	5 0	—	5 0 0	32,000	Chili	12, King-st., Liverpl.
San Donato	5 1/2 5 1/2	5 1/2	5 0	10/- May '94	5 0 0	75,000	Chili	9, Gracechurch-st.
San Jorge	5 1/2 5 1/2	5 1/2	5 0	7 1/2 % Apr. '88	5 0 0	32,000	Chili	3, Gracechurch-st.
San Pablo	3 1/2 4	3 1/2	5 0	10/- Sep. '89	10 0 0	22,000	Brazil	Liverpool
Santa Barbara	—	—	10 0	1/3 Dec. '88	5 0 0	80,000	Chili	70, Gracechurch-st.
Santa Rita	3 1/2 3 1/2	3 1/2 xd	5 0	15 1/2 % Apr. '94	5 0 0	20,000	Chili	Dashwood House, E.C.
San S-bastian	2 2 1/2	2 1/2	5 0	1/8 May '94	5 0 0	29,000	Chili	Dashwood House, E.C.
Segovia	—	—	1 0	—	0 4 0	160,070	Colombia	5, Cophthal-building
Tequira	—	—	1 0	—	0 19 6	300,000	Colombia	5, Cophthal-building
Tollima "A"	7 1/2 8	8	10/-	10/- Mar. '94	0 5 0	14,000	Venezuela	13, Winob-croast.
Vic. & Aletmirra	—	—	1 0	—	0 19 0	155,000	Argentina	Broad-st. Avenus.
W. Argentine	—	—	5/-	—	0 5 0	200,000	Argentina	2-5, Queen-street.
West Indian	—	—	5/-	—	0 5 0	700,000	San Domingo	49, Queen Victoria-st.
Xaruma	—	—	5/-	—	0 5 0	251,422	Ecuador	1, Gt. Winchester-st.



Name.	Closing Price, May 16, 1894.	Closing Price, May 11, 1894.	Par.	Latest Dividend.	Called up Per Share.	Shares Issued.	Situation of Mine.	Head Office.	Name.	Closing Price, May 16, 1894.	Closing Price, May 11, 1894.	Par.	Latest Dividend.	Called up Per Share.	Shares Issued.	Situation of Mine.	Head Office.
Henry Nourse	2 3/4	2 3/4	2 1/2	—	1 00	100,000	De Kaap	Warnford-court. 7	Otto's Kopje	1 7/8	1 10/8	1 10/8	—	1 00	437,888	Kimberley	115, Cannon-st., E.C.
Heriot (New)	3 3/4	3 3/4	3 1/2	—	1 00	195,000	Witwatersdr.	1, Crosby Square. 1	Paul Central	1 7/8	1 10/8	1 10/8	—	1 00	138,750	Transvaal	29-30, Hol. Via., E.C.
Joe's Luck	1 1/8	1 1/8	1 1/8	—	1 00	57,400	De Kaap	11, Queen Vic.-st.	Piggs Peak, New G.	3/8	—	—	—	1 00	280,320	Swaziland	6, Queen-street-place
Johannesburg Pur	3 3/4	3 3/4	3 1/2	12 1/2% Nov. '93	1 00	21,000	Witwatersdr.	Johannesburg.	Pfischelboom	1 3/8	1 4/8	1 4/8	—	1 00	81,000	Robotsdroom	19, Bury-st., E.C.
Jubilee	3 3/4	3 3/4	3 1/2	30% Jan. '93	1 00	32,000	Witwatersdr.	8, Old Jewry	Princes	1 3/8	1 3/8	1 3/8	—	1 00	72,240	Witwatersdr.	33, Cornhill, E.C.
Kamper	3 3/4	3 3/4	3 1/2	10% Jan. '93	1 00	100,000	Witwatersdr.	29, Holborn Viaduct. 1	Randfontein	13/16	1 1/4	1 1/4	—	1 00	1,916,500	Witwatersdr.	59, Holborn Viaduct.
Kimberley	3 3/4	3 3/4	3 1/2	—	1 00	98,872	Kimberley	29, Finsbury Circus.	Read's Drift	1 3/8	1 1/4	1 1/4	—	1 00	80,000	Transvaal	19, Finsbury Circus.
Kleinfontein (N)	31/32	33/32	1 1/8	—	1 00	150,000	Witwatersdr.	8, Old Jewry	Robinson	5 1/4	5 1/4	5 1/4	4% June '93	5 00	543,750	Transvaal	56, Holborn Viaduct.
Klerksdorp	2 1/2	3 1/2	3 1/2	—	1 00	150,007	Transvaal	110, Cannon-street.	Rodepoort Un. G.	2 1/4	2 1/4	2 1/4	—	1 00	100,000	Witwatersdr.	Warnford-court. 1
Knight	14/16	15/16	1 1/8	—	1 00	350,000	Witwatersdr.	19, Bury-street, E.C.	St. Augustine	—	—	—	—	1 00	485,000	Grigoland W	30-1, St. Swithun's-lane
Langlaagte Est. G.	4 1/4	4 1/4	4 1/4	12 1/2% Mar. '94	1 00	100,000	Witwatersdr.	59, Holborn Viaduct.	Salsburg New	2 3/4	2 3/4	2 3/4	—	1 00	1,000,000	1, Crosby-square	1, Crosby-square
Langlaagte, Royal	3 1/2	3 1/2	3 1/2	5% Sept. '93	1 00	100,000	Witwatersdr.	23, Drapers-gardens.	Schampsberg	23/8	23/8	23/8	-6 April '94	1 00	614,450	Lydenburg	55, Graham-st.
Lisbon-Berlyn	3 1/2	3 1/2	3 1/2	—	1 00	883,233	Lydenburg	110, Cannon-street.	Slakt	3 3/8	3 3/8	3 3/8	—	1 00	625,000	Zoutpansberg.	4, Sun Court, E.C.
Lucanpoort-Vrij Est.	10/16	10/16	1 00	6% Mar. '90	1 00	319,003	Witwatersdr.	Warnford-court. 1	Simmer & Jack.	8 3/4	8 3/4	8 3/4	10% Nov. '93	1 00	85,000	Witwatersdr.	33, Cornhill.
Do, do, do.	—	—	—	—	1 00	25,000	Witwatersdr.	8, Old Jewry	S.A. Gold Trust	16/8	17/8	17/8	10% April '93	0 10	220,000	South Africa.	8, Old Jewry.
Main Reef (New) G.	3 1/2	3 1/2	3 1/2	—	1 00	300,000	Witwatersdr.	8, Old Jewry	Spitkop (New) G.	3 1/8	3 1/8	3 1/8	—	1 00	144,531	Lydenburg	15, Bishopsgt-st. Wt.
May Consol.	9 1/2	10 1/2	10 1/2	—	1 00	430,000	Witwatersdr.	4, Lothbury.	Stanhope	1 1/2	1 1/2	1 1/2	50% May. '93	1 00	34,000	Witwatersdr.	1, Crosby Square.
May Deep Level G.	8 1/2	9 1/2	9 1/2	—	1 00	148,000	Witwatersdr.	31, Cornhill, E.C.	Stuthland R.	4 1/2	4 1/2	4 1/2	—	1 00	230,000	Budge-row, E.C.	8, Old Jewry.
Metropolitan (N) G.	5 3/4	5 3/4	5 3/4	—	1 00	75,000	Witwatersdr.	1, Crosby Square. 1	Taunton	—	—	—	—	1 00	96,000	Witwatersdr.	1, Crosby Square.
Meyer & Charl.	5 3/4	5 3/4	5 3/4	25% Dec. '93	1 00	71,887	Witwatersdr.	Warnford-court. 1	Trans. Coal Trust.	11/8	12/8	12/8	-8 Oct. '93	1 00	459,895	Witwatersdr.	Broad-t. House, E.C.
Middelfontein.	8 1/2	9 1/2	9 1/2	—	1 00	200,000	Witwatersdr.	Warnford-court. 1	Trans. Est. & Dev.	9/8	10/8	11/8	—	1 00	285,700	Transvaal	78, Old Broad-st. E.C.
Moodies G.&E.	8 1/2	9 1/2	9 1/2	-4 May '90	1 00	120,000	De Kaap	8, Old Jewry	Trans. Gold	1 1/2							

The following circular has been issued to the shareholders:—  
In consequence of numerous enquiries and for the information  
of new shareholders, I am instructed to give you the following  
particulars:—The property owned by the company, consisting of  
about 14½ acres, is situated upon the Farm Doornfontein,  
Witwatersrand, upon which the following companies are working:  
—City and Suburban, Meyer and Charlton, Wolhuter, Metro-  
politan, Heriot, Henry Nourse, Jumpers, &c. The claims,  
measuring 516 yards by 138 yards, are on the Main Reef. Mr. St.  
Vincent Erskine, the Government land surveyor and mining  
engineer, of Johannesburg, when reporting on the property,  
stated:—"The claims are situated about 4 miles to the east of  
the City of Johannesburg, between the Metropolitan and Jumpers  
Mines, and adjoining the Henry Nourse Gold Mining Company."  
Referring to the reef he states:—"It points true all along

**FIG IRON PRODUCTION.**—The output of pig iron in the four principal industrial countries of the world—viz., Great Britain, the United States, Germany, and France—has appreciably increased during the last 10 years, although it is doubtful whether the production has not been overdone. In 1884, the aggregate out-turn was 17,365,454 tons, of which 7,811,727 tons were made in Great Britain, 4,997,865 tons in the United States, 3,600,612 tons in Germany, and 1,865,247 tons in France. In 1885 the British output stood at 7,418,469 tons, the American at 4,044,526 tons, the German at 3,687,433 tons, and the French at 1,630,648 tons, making an aggregate of 16,778,076 tons. In 1886 Great Britain made 7,009,731

LEADHILLS, W. H. Pauli, May 14: Brown's Vein: The vein in the 160 fathom level going south of Jeffrey's shaft is 4 feet wide, nice'y mixed with spar and a little lead ore. In the 160 fathom level driving north of Wilson's shaft the vein is over 4 feet wide, a little harder and more promising, carrying a small rib of spar spotted with ore. Good progress continues to be made in each of these drivages. The winze below the 145 north of Wilson's shaft has been communicated to the 160, which has well ventilated that level; we shall, as soon as possible, commence sinking another winze below the 145, some 50 fathoms south of Jeffrey's shaft, in a vein 4 feet wide, which will produce 40 cwt. of lead ore per fathom. The vein in No. 1 stops over the 145, north of Jeffrey's shaft, is yielding 30 cwt. of ore per fathom. In No. 3 stops over same level north, the vein is worth 25 cwt. of ore per fathom. In the stop over the 130 north, the vein is worth 20 cwt. of ore per fathom. The vein in the 115 fathom level driving north of Jeffrey's shaft contains a strong mixture of spar, and producing occasional good stones of lead ore. In Nos. 1 and 3 stops above the 115 north of Jeffrey's shaft, the vein will produce on average 20 cwt. of ore. The vein in the 100 fathom level driving south of Wilson's shaft contains a strong mixture of spar but no ore to value. The eastern portion of vein being driven upon southwards at this level has become somewhat contracted, but showing a little ore at times. The crosscut east at the 100 south of Wilson's shaft is going forward regularly and at a fair rate. Ground rather hard at present. In the drift over the 100 fathom level north of winze the vein now yields 35 cwt. of ore per fathom. The vein in No. 1 stops over the 85 south of Wilson's shaft is producing 65 cwt. of ore per fathom. In the stop over same level north of winze the vein is 3 feet wide, worth 55 cwt. of ore per



fathom. No change worthy of remark in crosscutting east near forebrest of 70 fathom level south of Wilson's shaft. The vein in the stope over the 50 fathom level south of winze is yielding 45 cwt. of ore per fathom. In the stope below the 35 south of flat roof shaft the vein is worth 50 cwt. of ore per fathom. Sarrowcole vein in Gripp's adit driving south of George's Rount vein continues of a promising character, but producing no ore of value as yet.

**PRINCE OF WALES.**—S. Roberts J. Prowse, May 16: The crosscut north at the 193 fathom level is now extended 24 fathoms 4 feet, and every fathom driven shows clearer signs of approaching the lode.

**SOUTH CONDURROW.**—May 16: The shaftmen are busily engaged taking out ground at the 138 fathom level to receive balance bob. We shall be sending down this bob in a few days. The flat lode in the 153 and west maintains its size (about 6 feet wide), but it is harder and not so tiny as it has been. The stope in the back behind the end is worth £12 per fathom. (Signed) Wm. Rieff, Wm. Thomas, Fred. Rich.

**WEARDALE LEAD.**—Report on Weardale Company's mines for week ending May 12: Groverake: Adamson's drift west, vein 4 feet wide of spar, slower to work and poor, worth 12 cwt. per fathom; cubic fathom stope worth 12, 12, 14, 12, 16, 14, 12, 12, and 12 cwt. per fathom. Boltsburn: Stope above Watts' level in vein and north and south flats worth 20, 32, 20, 24, 34, 30, 14, 24, 16, 24, 15, and 18 cwt. per fathom. Greenlaw: Natrass gill drift, stope worth 14, 12, 16, and 16 cwt. per fathom. Lee's sump worth 12 and 30 cwt. per fathom. Sedling: The 64 level east in top part of slatey hasel has been driven 1 3-6 fathoms this week, vein 3 feet wide of floor spar with some rider mixed with ore. End worth 18 cwt. per fathom. The stope above the 64 level east and west of shaft are worth 14, 14, 16, 16, and 16 cwt. per fathom. The stope in south vein is worth 14 cwt. per fathom. The crosscut north from the bottom of shaft has been driven 15 2-6 fathoms in all. The end looks a little more favourable for vein, chiefly rider mixed with quartz and fluor spar. Ore raised for week, 82 tons; ore dressed for week, 89 tons; ore slag and fume smelted for week, 147 tons, producing 78 tons of pig lead.

#### COLONIAL, INDIAN, AND FOREIGN MINES.

**ALAMILLOS.**—Mine report dated May 9: In the 160 fathom level driving west of Taylor's engine shaft the lode is very wide, and is producing good stones of ore, valued at 1/2 ton per fathom. The lode in the 100 west of Judd's engine shaft has slightly declined in value; worth 1/2 ton per fathom. The driving of the 100 east of the same shaft is suspended, as we have now reached the end of the ore ground. Good progress continues to be made in sinking Jaldoro's winze below the 70 fathom level, valued at 1/2 ton per fathom. We expect to hole in a few days. The stope continues to yield well. Surface works are kept on very regularly, and the machinery is in good working order. Estimated raisings for May, 250 tons. The tributers returned 45 1/2 tons of mineral in the past month.

**BROKEN HILL PROPRIETARY.**—For the week ending the 17th inst., 11,803 tons of ore were treated, yielding 1278 tons of lead, containing 344,766 ounces silver. The price of the shares in Melbourne is £2 9s. buyers.

**BRILLIANT BLOCK.**—Mine manager's report for fortnight ending March 21: Underlie shaft deepened by contract 11 feet, total depth from No. 4 plat 128 feet. Reef in bottom is 5 feet thick of medium quality. No. 5 level west extended 32 feet by contract, total from shaft 94 feet. No reef in face at present. In the two stopes over the drive the reef varies from 2 to 4 feet thick of fair quality. No. 5 level east extended 6 feet by wages men, and 16 feet by contract; total from shaft, 86 feet. The reef in face is split up at present. In the two stopes over the drive the reef varies from 2 to 5 feet thick, good quality. No. 4 Level West: There is 1 foot of stone in face of low quality. Am stopping over the level on a reef varying from 1 to 2 feet thick of low quality. The No. 1 winze from this level sunk 24 feet by contract, total from level 80 feet. No stone in the present bottom. This winze has been holed to No. 5 level. No. 4 Level East: Have let contract to sink a No. 1 winze from this level, 145 feet from shaft, and have sunk 20 feet. There is 2 feet of stone in the bottom. The footwall drive on this level extended 9 feet by contract, total from shaft 324 feet, bringing the drive within a few feet of our eastern boundary, and shows a reef about 20 inches thick, medium quality. In the one stope over the level the reef varies from 6 inches to 2 feet thick of good quality. The hanging wall drive on this level extended 8 feet, total from starting point 132 feet. Am stopping over the drive on a reef 18 inches thick of good quality. No. 3 level east: Am stopping in one small stope at this level on 1 foot of stone of good quality. No. 1 level east: Stopping at this level on 3 feet of poor stone. Stone raised during the fortnight 660 tons. Stone crushed during the fortnight 607 tons for 920 ounces 6 dwts. gold.

**DON PEDRO.**—Mine Report No. 7; April 17: Rise through No. 6 Shoot: This has passed through A stope, and been risen to the 40 fathom horizon. From it we shall open into C stope immediately south, which we intend to continue until the hanging wall of the lode is reached. A stope has been re-started and another set fixed. The lode at present is of moderate quality. The mineral broken in driving the next set of back laths, however, shows a decided improvement. Lode under the No. 8 shoot: Developments on this shoot show it to vary greatly in quality. In the inclined rise from the 60 north east drive, within a few feet of low grade mineral we are breaking exceedingly rich stuff. We have not as much water as when last reported. The level being driven north from the 50 fathom crosscut is still under the lode, though a little mineral has been broken in the back of the drive. 60 fathom crosscut: For the last 9 feet we have had lode in the back of this crosscut, the lode being the No. 8 shoot, which is yielding at this point mineral equal to that broken in the corresponding part of the lode worked from the 50 fathom horizon. We are raising the back of No. 5 stope, and intend to drive from the breast of it horizontally through the No. 6 shoot. This will enable us to extend the 50 fathom tram road, and to put up another rise for the cheaper delivery of mineral as work in the stopes above get beyond the reach of the existing rise.

**FORTUNA.**—Mine report dated May 9: Canada Incoosa Mine: In the 150 fathom level driving west of O'Shea's engine shaft, the lode is small and without value. The lode in the 110 west of San Pedro's shaft, worth 1/2 ton per fathom, has improved and is regular and well defined. Los Salidos Mine: The 200 east of Taylor's engine shaft is laying open a rich piece of stopping ground, valued at 3 tons per fathom. In the 105 east of Palgrave's shaft the lode turns out some stones of ore. Cordova's winze, sinking below the 188 fathom level, worth 2 tons per fathom, has holed to the 200 fathom level. The lode continued productive throughout. No change of importance has occurred in the stopes since last reported. The smelting works are kept on very regularly, and the machinery is in good working condition. Estimated raisings for May, 250 tons. The tributers returned 89 tons of mineral in the past month.

**LA PLATA.**—Report received by last mail from Mr. Nines, the agent of the Gold Fields of Masambyque (Limited):—Alluvial Claims: Since my last I have pegged off 10 claims in the Monene, I can get good prospects from the holes I am putting down which (prospects or panning) are quite as good as those from the Revue. Several more claims have been applied for here, and, in fact, there is already a rush on—I have the waterfalls opposite the new township in our claims. This waterfall is of immense value to generate power to work a train or any machinery that may be required to work the alluvial; it is also a good tip or fall for tailings. Revue: I have made application for 10 claims here, which I am now prospecting, and before this reaches you shall have 10 or more claims pegged off. These claims adjoin those of the East African Syndicate to the west.

**LINARES.**—Mine report, dated 9th May: Pozo Ancho Mine: The 200 fathom level driving west of Pell's engine shaft continues to open out rich stopping ground, and is valued at 3 tons per fathom. The lode in the 155 west of the same shaft is small, and contains only spots of ore. The 178 west of Warner's crosscut turns out some good lumps of ore, but barely sufficient to value. Very good pro-

gress is being made in sinking No. 276 winze below the 178 fathom level. The lode turns out occasional stones of ore. The stope continues to yield very well. Surface works are kept on with great regularity, and the machinery is in good working condition. Estimated raisings for May 200 tons. The tributers returned 157 tons of mineral in the past month. Quintenta Mine: Taylor's Engine Shaft: We have intersected the lode in the 185 south, and the men are put to drive east on its course. The lode in the 165 east, valued at 1/2 ton per fathom, continues regular and compact. In the 150 east worth 1 ton per fathom. The lode is very open, and yields good rocks of ore. The 130 east is a little more open, but continues unproductive. Estimated raisings for May 150 tons. The tributers returned 63 1/2 tons of ore in the past month.

**LANGLAAGTE ROYAL.**—The general manager, Mr. W. Laurie Hamilton, reported on April 12 as follows: "To the Chairman and directors, Langlaagte Royal Gold Mining Company (Limited).—Gentlemen: Your instructions, of four months ago, to prepare a report for yourself and shareholders have not been obeyed because of two things—first, your mine had nothing but the remnants of the third level in sight, and I could not prophesy what was still unseen; and, second, I desired a more intimate knowledge of the mine before attempting to report or advise as to the future. Being almost down to sixth level with incline shafts, and having now proved the main and south reefs on fourth and fifth levels, I consider it safe to give you a preliminary report. Before taking charge I knew something of the intrinsic value of your property, and my estimate of this has increased with closer acquaintance. I knew also the state of the mine, with less than 15,000 tons of the poorest grade in sight, as also the condition and quality of the gear and machinery; but, having your assurance of every assistance in putting the property on a thorough and permanent footing, I willingly relinquished the New Primrose and undertook the Langlaagte Royal, feeling assured, with ordinary fortune, of being able to bring it to an equal success as the Primrose. I would here say my immediate predecessor, Mr. Clement, who had charge less than two months before we made the friendly change, was in no way responsible for the condition of the mine, except for the improvements he made and initiated during his short stay; the very complete and correct plan he made, and the information he so freely gave, greatly helped to make me *au fait* with all the peculiarities of the mine.—Mine: Since November we have sunk the two incline shafts through fourth and fifth levels, are approaching the sixth, and have made the following openings and strikes.—Third Level: We struck the south reef (which had been lost) on the west of main cross cut, and have driven in reef to west fault, through which lies the rich west shoot. Here our average thickness has been 25 inches and assay value 38 dwts. At east end we have driven south through No. 2 dyke, and have just struck the south reef; this is a valuable strike, proving the dyke to be another overlap and greatly increasing the ore above present levels. Fourth level has been opened east and west from main shaft on north side of No. 1 dyke; the averages for 300 feet driven have been 48 inches thick and 27 dwts. assay.—Fifth Level: The main reef is opened right through from main to east shaft, and has been struck at three other points in east cross cut. Average thickness 44 inches and assay 23 dwts. The south reef of good thickness and panning very well has been struck in both east and west crosscuts, but not sufficiently driven on to given averages. We have now 12 drives on reef and can develop with hand labour over 12,000 tons per month. Four drills are now working, and in a week or two, when new compressor is started, this will be increased to 10 drills, and we will then have 14 drives on reef and be able to develop 18,000 tons per month. We have bought and erected the following: 106 h.p. boiler, No. 5 Gates' stone breaker, 20 h.p. winding engine, lathes, drilling and boring machines, &c.—Mill: Our old 40 head mill has been changed into a new one by removing Australian mill, old king posts, stems, heads, &c., and substituting 950 lbs. stamps. By doing this, although our rock is getting harder, our crushing capacity has been increased from 3200 tons to 4500 tons. With 80 stamps, which we hope to have running on 1st July, we should crush at least 10,000 tons per month. Three new boilers, with Green's economiser and chimney, have been erected; these will supply steam for 80 stamps and cyanide works, and have already reduced the coal consumption for 40 stamps from 12 tons to 5 tons per day.—Cyanide (tailings treatment) works: These have been running two weeks, and are treating 3260 tons per week. They are built on the latest designs, the original plans being made by Mr. C. Butters, and are the best and most complete works yet erected. The assay extraction, so far, has been 4.7 dwts. fine gold per ton. By the erection of settling vats, the daily make of tailings will be treated at once, which will mean considerable saving in labour and cyanide.—Yields and cost: The grade of this mine being from 8 to 10 dwts. (off plates), the natural result of running it for months at 12 to 13 dwts. left only low grade ore in third level; from the following it will be seen the yield is gradually improving:—November, 4.61 dwts. per ton; December, 4.91 dwts. per ton; January, 5.16 dwts. per ton; February, 5.78 dwts. per ton; March, 6.45 dwts. per ton. In shaft sinking and development we spent in March over £2000; charging the proportion of this proper to ore worked, our profit would be £1500. Although we have increased our development from £955 so enormously, our cost per ton is coming gradually down, the milling cost having been brought down from 7s. 9d. to 4s. 3d. per ton. I estimate our total cost, including development, will not exceed 26s. per ton (mining, milling and cyanide), and our yield from mill and cyanide will be about 45s., leaving a profit of 19s. per ton. By the end of 1894 your mine will be sufficiently developed to supply at least 160 stamps, and considering the extent of your property (including south block) it is well worth your consideration the extension of your operations to a much larger mill than 80 stamps. The gold is lying idle in your mine, and every extra ton worked not only increases your total profit, but increases the profit per ton by decreasing the cost." The result for April is as follows:—Production, 4015 ounces; net profit, £5400.

**LOMA.**—The secretary has received by this mail the following report from the mine: The superintendent, Mr. Prender, writes: "All is now running; steady washing with a 3 1/2 inch nozzle. From panning at the Soto mine I believe we will do well; in the pans we get 10 to 30 colours of gold. The work for reservoir is being pushed ahead. I enclose invoice of gold bar No. 14, value £230." Mr. Carleton, the engineer in charge of the Cruz-Gorda extension of ditch line, writes: "I am glad to report satisfactory progress in freighting the pipe from Mariquita to Gearomo. We have also rivetted 1026 feet and put in place 600 feet. I have strong hopes of being able to pass the Cruz-Gorda water through the pipe line in May."

**MILL'S DAY DAWN.**—Mine manager's report for fortnight ending March 26: No. 8 level west extended 9 feet by contract, the country very much broken up on the footwall side. The reef on the hanging wall has not been broken for the last 30 feet of driving. Have prepared the plan for crosscut to intersect the winze from bottom of monkey shaft in No. 7 level, which if driven would prove the footwall at that point. The shaft winze has been sunk 11 feet by contract. The ground is hard and does not shoot well. No. 7 level west on the hanging wall is driven a further distance of 14 feet by contract. There is a reef 3 feet thick of fair quality. The stope over this level and No. 7 east vary in size from 1 to 4 feet thick of fair quality. No. 7 level west on the footwall has been driven 16 feet by contract. The reef has fallen back into the footwall side so much that we shall not drive further until we get through the whole of the reef and on to the footwall. There is 10 feet of reef in the face at present. In the stope the reef varies from 3 to 8 feet thick of good quality. Have started the crosscut in the eastern level for the footwall which has been driven 19 feet through broken country. No. 6 level east, reef in stope varies from 2 to 5 feet fair quality. In the western side the footwall reef varies from 1 to 5 feet thick fair quality. In driving east we holed on the level off the crosscut under No. 5 level after sinking 22 feet, which appear at present to be two distinct veins, the upper vein varies from 1 to 2 feet thick for a distance of 60 feet from crosscut under No. 5 level west. The reef in stope over No. 5 level west varies from 2 to 4 feet in thickness of fair quality. The reef over the eastern level will average 4 feet medium quality. The reef in the stope over No. 4 level west (average 2 to 6 feet of medium quality). The stope over

the eastern level vary from 2 to 5 feet of good quality. Stone raised 1900 tons. Water baled 6 hours each day.

**MOSMAN.**—Mine manager's report for fortnight ending March 30: North Australian Mine: Byerley level crosscut driven a further 4 feet, total from level 54 feet. Roof very hard with no indication of reef. Byerley level winze deepened 10 feet, total depth from level 130 feet, formation 15 inches wide, with no quartz at present. Stopes: The stope are turning out quartz about as usual. One or two faces rather larger than the average, yielding a little more than usual. The quality, however, is somewhat poorer than where the reef is smaller. Stone raised 70 tons for fortnight in hopper, 390 tons.—Wyndham Mine: No. 13 level north extended 31 feet, total from shaft 149 feet. The reef is 12 inches thick, worth 1 ounce per ton.—No. 12 level rise: A rise has been put up from the back of No. 12 level 42 feet, and has broken through to the stope. This rise is to avoid breaking a lot of blank ground away to get at the stone.—No. 8 Level South Winze: Have started winze to connect with the stope below. Have sunk 10 feet, and about 20 feet more will break through. The reef in the winze is about 12 inches thick, worth 1 1/2 ounces per ton. No. 8 level south discontinued, contractors having completed 100 feet. There is no stone in the face.—Stopes: Over No. 8 level south the reef for a length of about 15 feet thick varies from 4 inches to 18 inches thick, and is worth, say, 1 1/2 ounces per ton. Over No. 9 level the reef for a few days nearly cut out, but appears making again, there being for a length of about 25 feet 10 inches of fresh, fairly good stone, worth say 1 1/2 ounces per ton. Above No. 11 level the reef: averages about 9 inches in thickness, worth say from 15 dwts. to 17 dwts. per ton. Over No. 12 level north the reef is from 6 inches to 3 1/2 feet thick, but where most of the crushing stuff is coming from its quality is not more than from 8 to 9 dwts. per ton. Above No. 13 level north the reef is about 12 inches thick, worth 1 ounce per ton. On the south side of shaft the reef is from 8 inches to 10 inches thick, worth about 16 dwts. per ton; in the bottom of the level the reef is 18 inches thick. Stone raised during the fortnight about 300 tons and carted to the mill.

**NEW QUEEN.**—The following fortnightly report has been received from the mine, dated Charters Towers: No. 2 Level North The winze from this level has been sunk a further depth of 17 feet, making 88 feet from level with no change.—No. 4 Level South: Stopping has been continued over this level. The formation still continues large, varying from 1 foot to 11 feet in thickness. There is very little stone in this stope at present; the reef is irregular, from 3 inches to 1 foot, a large portion being black.—No. 5 Level South: This level has been extended a further distance of 15 feet, making total distance from underlie shaft 213 feet. There is very little stone in face of level. Stopping has also been carried on, the ground continuing hard, with a reef varying from a leader to 10 inches. No. 5 north level has been extended a further distance of 10 feet, making 135 feet from underlie shaft. The formation in the face of level is about 1 foot wide, with a thin vein of quartz. The hanging and footwall is very hard and shoots badly. Stopping has been carried on; the reef is very bumpy, varying from 3 inches to 8 inches. The underlie shaft has been sunk a further depth of 16 feet, making a distance of 34 feet from the No. 5 plat, with no stone at present in the face.—No. 4 Formation: The No. 1 northern level has been extended a further distance of 17 feet, making 199 feet from end of cross cut. The formation has been about 7 feet in width during the fortnight. All the formation has been cut off throwing it back into the footwall, a distance of about 5 feet. A splice of stone seems to be making on the hanging wall, and to all appearance there is every chance of stone coming in again. Stopping has also been carried on; the reef is irregular, varying from 3 to 8 inches, with portions of blank ground. Quantity of stone raised during the fortnight: No. 1 A level 43 trucks, No. 4 south level 120 trucks, No. 5 north and south level 218 trucks, No. 4 formation 86 trucks, total 467 trucks, equal 320 tons.

**PESTARENA.**—Monthly report: Ende: The lode in the 55 east on No. 1 lode is 1.70 metres wide. It carries two branches of pyrites 30 and 15 centimetres in width respectively, the rest being composed chiefly of quartz mixed with pyrites. The splitting up of the lode is the same as occurred at the 70 fathom level, therefore it is hoped an improvement will take place, as it did there at the 70 fathom level. Its estimated value is 8 tons at 1 ounce 10 dwts. per fathom. The 70 east on No. 1 lode shows a lode of quartz 40 centimetres wide, marking pyrites. It is well defined and an improvement is looked for, but at present there is nothing to value. The 70 west on A and B lodes is at present very disturbed. It carries a small branch of pyrites on the footwall, but is much mixed with schist, and its produce is too little to value. The 140 west on No. 5 lode averages 20 centimetres in width, carrying 10 centimetres of solid pyrites, and looks promising, as it has improved since being resumed. Its estimated value is 1 1/2 ton at 1 ounce 10 dwts. per fathom.—Crosscuts: There is nothing new to report in any of these since the 3rd instant. Taken as a whole, the stopes show no change, and continue to produce the usual quantity and quality of ore.—Stabioli Mine: A branch has been cut in the Anza level north, which produces 3 tons of ore assaying 1 ounce 10 dwts. to the ton. At Stabioli South a level has been commenced about 25 metres above the Anza, this being more economical than continuing the winze.—Machinery: All continues to work satisfactorily.—(Signed) W. Henwood Trelease, T. Henry Messa.

**PUNJOM.**—Copy of manager's report for February: August shaft has been deepened 3 feet, and fully timbered to bottom, bearers to carry the new 12 inch plunger pump put in their places, opening sets fixed, and driving commenced and extended 4 feet, the cill of drive is 85 feet 6 inches below the 110 feet level, depth of shaft 90 feet. The ground at present is hard and rather difficult to drive. Surface shaft has been continued and communicated with stope, bottom section, which is a great advantage. No. 1 trial shaft was stopped early part of the month for our stope to come up, and so take away the quartz to better advantage. No. 2 trial shaft was continued to a depth of 54 feet 6 inches, and a crosscut put out to meet the lode, but without any great result of great value, passing, however, through various leaders of quartz carrying gold, the largest of which we opened up and followed, and which led to the main body or a continuation of the north and south lode (struck on the 8th instant). The lode at present is 4 feet wide, all of which will be sent to mill; its value is estimated at from 15 dwts. to 1 ounce per ton; this will be better known as we extend operations. I am of opinion that it will extend for hundreds of feet, and open up a most valuable piece of ground, as along the line of reef Chinese old workings can be traced for a considerable distance. West drive was extended 12 feet 6 inches into more settled country, and the prospects are improving. We have a leader of stone over 1 foot wide of average quality.—South Drive: Not much has been done only 10 feet having been driven without any result. The quartz from the stope over this level often blocks the way, and retards progress.—Stopping at present is chiefly confined to our western section, which is of lower grade ore than that from our eastern section. I have hopes that the two new stopes we are opening up east will yield good stone, as also from our trial shafts stope when fully opened up. Estimated quantity of quartz raised 690 tons. Chinese New Year holidays delayed all work in the mine for four days except the milling. New machinery was started on February 10th, and gave great satisfaction. The new boiler arrived at the mines, and was fixed in its place 23 days after leaving Singapore. Quite a record trip with heavy machinery. Milling was carried on for 23 days, crushing 800 tons for 404 ounces 1 dwts. 12 grains of gold.—General: Everything is going on satisfactorily, and the health of the camp is good.

**THISTLE REEF.**—The mine manager reports under date April 18 as follows:—By this mail I can only give you a few particulars as I have only had time to do a certain amount of prospecting on the mine. It took me some time to procure white and black labour, also to get the necessary tools and plant from Barbarton. I beg to inform you that the mine is now in full swing, working both day and night. I am also pleased to be able to inform you that yesterday we obtained some very fair prospects in both levels: showing from 2 to 10 dwts. in the pac. Will send you full measurements of drives to shafts, also amount of quartz at grass by next mail. At present I have six white men, five of whom have worked under me before, and are good men, also 50 natives.



**AUSTRALASIAN.**—Fortnightly report of Captain John James, mine manager, dated March 29: In the underhand stope going north on the Orient reef there is no change. The crushing stuff keeps about the same, and shows a little gold. In the stopes over the level going south the crushing stuff keeps about the same, and shows a little gold. Since my last report I have holed through from those stopes to the No. 1 south Great Eastern at their 650 feet level. There is 216 feet on our southern boundary from where we got through here to where we are working in the stopes over the 690 feet level, but the reef is in bunches in it. In the stopes over the 690 feet level there is no change; the crushing stuff there shows a little gold. For the four weeks ending March 28 there were 223 tons of quartz raised, and crushed for a return of 142 ounces 2 dwts 6 grains smelted gold. There were but five head of stampers crushing this month, but there will be 10 head next month. We were three days idle on account of the flood water, as it was not safe to leave the men down.

**CAPE COPPER.**—Captain Henwood, March 31: Ookiep: The rock in the 130 fathom cross cut north of 75 winze is composed chiefly of quartz. This driving has been temporarily suspended, and the men are put to drive east and west to prove the productive ground recently passed through in this level situated about 12 feet from the forebreast. Each level has been started in ground yielding stones of copper ore, but not to value. Nothing of importance having been found in the 117 fathom cross cut south of east level, it has been suspended. The ground in the 117 fathom cross cut north of east level is producing occasional stones of copper ore. The 92 fathom cross cut south of 46 winze is suspended for the time, and the men are put to drive east back about 21 feet from the end to prove a branch of copper ore we passed through at that point. The drive in back of 92 fathom level south east of 42 winze has fallen off in yield; at the present time it is only producing 1 ton of copper ore per fathom. The intermediate level, which is situated about 27 feet above this point and 18 feet to the south of it, is yielding 6 tons of copper ore per fathom. The 80 fathom level south east of new shaft is yielding good stones of copper ore, but not sufficient to value. The rock in the 80 fathom level north east of 49 winze is composed of quartz and iron containing spots of copper ore.—Captain Henwood, March 31: Trial Mines: Nababep south: There is no material change to notice in the ground in bottom of shaft sinking below the 59 fathom level, it is still spotted with fine specks of copper ore throughout.—Spectakel: The stopes in the bottom of the 36 fathom level and upper levels are yielding fully their estimated quantities of copper ore.—Copperberg: The rock in bottom of winze sinking below the east drive having become unproductive it has been suspended, and the men are put to stope the productive ground laid open in the adit level with the object of following up its continuity.—Returns for March: Ookiep, 1750 tons of 19 per cent. Spectakel, 165 tons of 29 per cent.—Arrivals at Swans: The *Magnus* with 2350 tons of ore, and the *Oakhdale* with 1270 tons of ore and 190 tons of regulus.—Arrival at Port Nolloth: The *Glanrafon*.—Tilt Cove: East Mine: Captain W. R. Toms; Output for March: 5410 tons of 4 per cent, wet assay.

**CHIAPAS.**—Mine report for fortnight ending 15th April: Providencia No. 2 west drift advanced 11 feet 7 inches, total 69 feet 5 inches. Connection made with Old Providencia open cut, thus saving six men wheeling. Assays 17 to 21 dwts, gold, 15 to 20 ounces silver, 8 to 9½ per cent of copper. 5 tons extracted. Providencia No. 3 west drift advanced 9½ feet, total 39½ feet. Face of drift showing spots of mineral. Expecting to cut ore shortly. Santa Fé drift advanced 6 feet 7 inches, total 57 feet 5 inches, in mixed ore, carbonates showing freely. Assays 19 to 19½ dwts, gold, 3½ to 9 ounces silver, 4.7, and 5.3 per cent copper. Extracted 20 tons. Taylor No. 3 winze advanced 7 feet 9 inches, total 47 feet. No change. In Santa Fé No. 2 winze cutting pump station until 5th inst., when water giving out pump ceased. Weather continues dry. In Taylor No. 3 stope extracted 198 tons fairly good stone. Assays 12 dwts, gold, 6 to 8½ ounces silver, and 3.3 to 4.1-3 per cent of copper. In Taylor No. 2 stope extracted 58 tons. Improved in back. Assays 9.1-3 to 25 dwts, gold, 9 to 16½ ounces silver, and 3 to 4.6 per cent of copper.—Old Providencia: Extracted 317 tons. Ore continues good.—Santa Fé Stope: Extracted 306 tons. Assays 11½ to 11 dwts, gold, 8 to 7 ounces silver, 3.5 to 3.3 per cent copper.

**CHAMPION REEF.**—Fortnightly report of Captain James Rowe, superintendent, dated April 23: Dalyell's shaft: This has been sunk 5 feet, total depth 685 feet 9 inches. The shaft being now in the dyke is suspended. The 685 feet level south from bottom of shaft has been driven 30 feet 6 inches. Lode 1 foot 3 inches wide assaying 2 ounces 17 dwts. 5 grains of gold per ton.—Garland's shaft: This has been sunk in the dyke 8 feet. We are carrying the shaft of sufficient width for bottom plat. The 530 feet north of west crosscut driven 31 feet 9 inches, total length 382 feet 6 inches. Lode is pinched to a mere stringer by a hard band of schist rock. We expect the lode to open out again soon. No. 3 rise in back of 530 risen 17 feet 3 inches, total height 30 feet 6 inches. Lode is pinched to a mere stringer of quartz. Rise in back of 530 south of crosscut risen 14 feet, total height 92 feet. This is communicated with 440 south. New winze below 530 south close to the dyke has been sunk 7 feet. Lode 3½ feet wide assaying 1 ounce 18 dwts, 9 grains of gold per ton. 440 feet level north of west crosscut driven 20 feet, total length 360 feet 6 inches. Lode 3½ feet wide assaying 2 ounces of gold per ton. No. 3 winze below level sunk 3 feet 6 inches. Lode 6 inches wide assaying 11 dwts. 15 grains of gold per ton. This has been suspended. Rise in back of 440 south of west crosscut risen 11 feet, total height 50 feet 3 inches. Lode 2 feet wide assaying 1 ounce 17 dwts. 14 grains of gold per ton. No. 2 new rise in back of 440 north 90 feet north of No. 1 rise has been put up 19 feet 9 inches. Lode 5 feet wide assaying 1 ounce 6 dwts. of gold per ton. 340 feet level south of west crosscut driven 31 feet 9 inches, total length 91 feet. Lode 5 feet wide assaying 1 ounce 16 dwts. 13 grains of gold per ton. New rise in back of level risen 2 feet 6 inches. Lode 2½ feet wide assaying 1 ounce 18 dwts. of gold per ton. No. 2 winze in bottom of 340 north sunk 8 feet, total depth 55 feet. Lode 2½ feet wide assaying 2 ounces 7 dwts. of gold per ton.—Ribblesdale's shaft: This has been sunk 8 feet, total depth 498 feet 9 inches. Lode small and without value. 440 south driven 22 feet 9 inches, total length 248 feet 11 inches. Lode pinched to a mere stringer of quartz. 340 feet level south driven 14 feet, total length 551 feet 2 inches. Lode 1 foot wide assaying 2 ounces 17 dwts. 15 grains of gold per ton. Winze below level sunk 13 feet 3 inches, total 24 feet 3 inches. Lode 1½ feet wide assaying 2 ounces 10 dwts. 9 grains of gold per ton. New rise in back of level, 6 feet south of winze, risen 8 feet 6 inches. Lode 2 feet wide assaying 1 ounce 2 dwts. 13 grains of gold per ton. 440 feet level north of winze sunk in bottom of 340 north on south part of fold has been driven 32 feet 9 inches, total length 56 feet 9 inches. Lode 4 feet wide assaying 2 ounces 11 dwts. 4 grains of gold per ton. No. 1 rise in back of 240 south of shaft risen 5 feet 9 inches, total height 21 feet 9 inches. Lode 4 feet wide assaying 1 ounce 18 dwts. 20 grains of gold per ton. Winze below level sunk 8 feet 3 inches, total depth 102 feet 3 inches. Lode 1½ feet wide assaying 2 ounces 3 dwts. 2 grains of gold per ton. 200 feet level south of No. 1 rise in back of 240 south of shaft has been driven 33 feet, total length 211 feet. Lode 1 foot wide assaying 1 ounce 18 dwts. 20 grains of gold per ton.—Carmichael's Shaft: The 315 feet level north has been driven 16 feet 6 inches, total length 571 feet 9 inches. Lode 2 feet wide assaying 2 ounces 7 dwts. 3 grains of gold per ton. Rise in back of 315 south of cross cut, west of shaft, has been put up 6 feet 9 inches, and communicated with vertical shaft at the 225 feet level. We are now engaged enlarging the rise so as to bring Carmichael's shaft down to sink on the lode.—Rowe's Shaft: The 315 feet level south of shaft has been driven 23 feet 8 inches, total length 52 feet. Lode 4 feet wide assaying 2 ounces 13 dwts. 9 grains of gold per ton. We expect to effect a communication with 315 north of Carmichael's in a few days.

**CHAVEN'S CALEDONIA.**—The following fortnightly report has been received from the mine, dated Charters Towers, March 29: For the past fortnight No. 9 level has been extended a further distance of 9 feet, making a total of 198 feet from the slide. The reef in this level is about 9 inches thick. In No. 1 stope the reef is about 9 inches also, but in the Nos. 1 and 2 stopes it will average 10 inches, in the Nos. 4 and 5 stopes 8 inches. No. 8 level has been extended

5 feet by the three contractors, which makes a total of 30 feet from the slide; the reef in this level is a bit smaller at present, but in the first two stopes it will average 1 foot in thickness, in Nos. 3 and 4 it will average 10 inches, but Nos. 5 and 6 it will average 8 inches. In the stopes over No. 7 level the reef is about 6 inches thick. In No. 6 level there has been no work done for the past fortnight, as I am waiting for the underhand stope to be advanced a little, so as to take it forward in body, as the ground will work a little better; the reef remains about the same in the stope over this level, it will average about 7 inches thick. The cross cut which is in No. 4 level has been extended 9 feet, making a total of 13 feet from the level, and I expect to break through into No. 5 stopes in about another fortnight. The estimated haulage of quartz for the fortnight is 107 tons, making about 596 tons for the present crushing.—(Signed) G. Cabassi.

**COROMANDEL.**—Superintendent's report for fortnight ending April 21: Coromandel Shaft, 420 feet level north: This has been driven since last report 16 feet 10 inches, and its total length is now 104 feet 10 inches from cross cut. There is no change to report in this end, the lode being still small and unproductive.—420 feet level south: There is still quartz in this level, but, although 18 inches wide in the back, it does not hold to the bottom of the drift. The assay value of this quartz is 8 dwts, per ton. Measurement for the fortnight, 10 feet. 320 feet level north driven 14 feet 2 inches, total from cross cut 345 feet 8 inches. Lode in present end 1 foot wide of solid quartz, assaying 16 dwts, per ton. Prospect shaft sunk 8 feet, total 491 feet 10 inches. No lode in shaft.—440 cross cut north east: This end has been advanced 17 feet 2 inches; the total length of the drive being 145 feet 4 inches. We have passed through the dyke, but as yet have discovered no lode. The ground in the present end is extremely hard, but we occasionally meet with patches of pyrites and quartz.—500 feet level south of winze: As advised in my last report cross cuts have been extended east and west of this drive a distance of 20 feet. No other branches of importance having been discovered we have resumed the drive south on the leader carried in the former end. This is at present about 4 inches wide, and produces only a trace of gold in the assay.—North Trial Shaft: At a depth of 30 feet this shaft unbottomed the old workings. The branch of quartz beneath was 2 inches wide, and showed a little gold in the pan. A drift southward has been extended about 40 feet, and has been alternately in old works and lode matter similar to that seen in the shaft.

**COLOMBIAN HYDRAULIC.**—A. Fitzgibbon, April 1: Ran No. 193: Mr. Bavan wrote the board last on March 22, since when we have been running without interruption on "Clark's Bank" (but on the east side), where we have laid some 20 boxes in a fork sluice. I hope to be able to clean up and deliver over the mine to Mr. Sherman on the 26th inst.

**GOLD FIELDS OF MYSORE.**—Mine report for fortnight ending April 23: At south shaft the 470 feet level north has been driven 3 feet. Total length 79 feet 3 inches. Lode 1 foot wide, assaying 1 ounce 18 dwts. 22 grains of gold per ton. 470 south driven 5 feet 3 inches, total length 81 feet 3 inches. Lode 2 feet wide, assaying 1 ounce 13 dwts. 13 grains of gold per ton. The 380 feet level north has been driven 2 feet, total length 181 feet 10 inches. Lode 1 foot 3 inches wide, assaying 18 dwts. 20 grains of gold per ton. 380 south driven 4 feet, total length 168 feet 3 inches. Lode 3 feet wide, assaying 1 ounce 4 dwts. 13 grains of gold per ton. The 380 crosscut east has been driven 3 feet 6 inches. Total length 222 feet 3 inches. There is no change to note as yet. Prospecting work is being pushed ahead and from the report, I sent to-day, it will be seen that the deeper developments on the lode are turning out fairly well.

**GOLD FIELDS OF MYSORE.**—Fortnightly report on prospecting work, dated April 25: West Balaghat Block, No. 1 Shaft: North drive has been driven 4 feet 6 inches, total distance from shaft 31 feet 10 inches. Lode in the end 2 feet 4 inches wide, assaying 1 ounce 5 dwts. 5 grains of gold per ton. South drive has been driven 5 feet 9 inches, total distance from shaft 47 feet 9 inches. Lode in the end 2 feet 6 inches wide, assaying 1 ounce 3 dwts. 14 grains of gold per ton. No. 2 shaft has been sunk 3 feet 10 inches, total depth 122 feet. Lode in the bottom 1 foot 8 inches wide, assaying 1 ounce 1 dwt. 4 grains of gold per ton. North drive 100 feet from surface has been driven 3 feet, total distance from shaft 56 feet 4 inches. Lode in the end 2 feet 6 inches wide, assaying 1 ounce 15 dwts. 4 grains of gold per ton. In the back of this drive we have holed to what appears to be the bottom of old workings. South drive has been driven 3 feet 6 inches, total distance from shaft 66 feet. Lode in the end 1 foot 6 inches wide, assaying 1 ounce 10 dwts. 9 grains of gold per ton. No. 3 shaft north drive has been driven 8 feet 3 inches, total distance from shaft 20 feet 3 inches. Lode in the end 2 feet 6 inches wide, assaying 1 ounce 18 dwts. 18 grains of gold per ton. South drive has been driven 13 feet, total distance from shaft 49 feet. Lode in the end 3 feet 6 inches wide, assaying 1 ounce 17 dwts. 15 grains of gold per ton. We have passed through some rich rock in the last 12 feet drive. The lode still shows visible gold. No. 4 shaft has been sunk 5 feet 6 inches, total depth 116 feet 6 inches. Lode in the bottom 1 foot 3 inches wide, assaying 15 dwts. 3 grains of gold per ton.—Road Block No. 3 shaft north, No. 2 eastern lode: This shaft has been sunk 17 feet, total depth 42 feet. Lode in the bottom 1 foot 6 inches wide, assaying 10 dwts. of gold per ton.

**KEMPINKOTE.**—Fortnightly report for fortnight ending 24th April: Garland's shaft has been sunk 14 feet, making a total depth of 173 feet 9 inches. During the fortnight we cut a small branch of quartz, which shows gold in the pan, but nothing of importance. The shaft has been secured and timbered a further distance of 21 feet. Henty's shaft has been sunk 6 feet 6 inches, making a total depth of 186 feet 6 inches. There is no change to report. 173 feet level crosscutting west has been advanced 9 feet, making a total from the shaft of 21 feet 6 inches. The air compressor will start in a few days, and we will then commence driving south on the course of the vein towards Garland's shaft.

**MEYER AND CHARLTON.**—April 19: The trial crushing of main reef was made last week, 56 tons being put through the mill, which yielded by amalgamation 6 dwts. 21 grains per ton, the tailings assaying 5 dwts. 8 grains. This shows the value of the ore to be 12 dwts. 5 grains. The ore was mixed from a drive embracing the whole width of reef (12 feet) and from the west side of crosscut. I think that if the reef were mined from a stope a much better result could be obtained, there would be a better chance to pick out the sandstone as it would be broken in larger lumps. In driving, the greater portion of the waste is broken so fine as to make it an impossibility to pick it out. In calculating the amalgam that would be absorbed by the plates and undue quantity of sandstone that was mixed with the reef, I estimate the milling value of the reef to be 9 dwts. per ton, taking it 8 feet wide and allowing the other 4 feet for waste.

**MOUNT ZEEHAN (Tas.).**—Manager reports for four days ended March 30: Argent section, main engine shaft, No. 6 lode, 72 feet level north, ore raised 6 tons 13 cwt. fair seconds. 72 feet level south extended 20 feet, total 85 feet. Ore raised 35 tons 15 cwt. good seconds. Lode is 3 feet 6 inches wide, of masterly character, and going down well underfoot, which warrants extension of No. 2 level south without delay. Intermediate drive south extended 11 feet. Ore raised 28 tons 12 cwt. good seconds. Lode 2 feet 6 inches wide of good ore. 132 feet level north, ore raised 58 tons 13 cwt. of medium quality seconds. 132 feet south risen 2 feet 6 inches, total 17 feet. Ore raised 5 tons 4 cwt. medium quality seconds. Lode 2 feet wide, quality as last reported.—France's Lode: Prospect shaft sunk 3 feet 8 inches, total 34 feet 8 inches. Lode 5 feet wide, strong character, and carrying 2 feet of very good ore.—Kelly's Lode: Have started trial shaft and raised 1 ton 6 cwt. first class ore, assaying 75½ per cent lead and 123 ounces silver per ton. Lode 2 feet wide. Concentrator has been run 40 hours, and milled 132 tons 15 cwt. seconds for 21 tons 3 cwt. concentrates, containing about 15 tons 16 cwt. of lead and 1562 ounces of silver.

**NO. 7 NORTH-EAST QUEEN.**—The following fortnightly report has been received from the mine, dated Charters Towers, March 30: During the fortnight Roberts and party crushed 83 tons for 25 ounces 16 dwts. 12 grains of smelted gold from the stails over No. 5 level. Perry and party crushed 15½ tons for 27 ounces 2 dwts. 18 grains of gold. Hall and party 17½ tons for 9 ounces 10 dwts. of gold. The

other tributes are looking fairly well in the different faces. Total amount of stone raised from various parties, 90 tons.—(Signed) H. Davis.

**OOREGUM.**—Superintendent's report for fortnight ending April 24: Taylor's shaft has been sunk 13 feet, total depth below the 460 feet level 90 feet. Lode 1 foot 6 inches, value 3 ounces 5 dwts. 8 grains. 460 feet level south advanced 31 feet 6 inches, total 264 feet. Lode 3 feet 6 inches, value 1 ounce 2 dwts. 21 grains. No. 1 winze 460 feet level south sunk 6 feet 6 inches, total 10 feet 3 inches. Lode 2 feet 6 inches, value 3 ounces 3 dwts. 3 grains. Wallroth's shaft has been sunk 7 feet, total 834 feet 6 inches. Lode 1 foot 9 inches, value 12 dwts. 760 feet level south advanced 27 feet 3 inches, total 120 feet 6 inches. Lode 1 foot 6 inches, value 16 dwts. 8 grains. No. 1 rise 760 feet level south commenced, 10 feet risen. Lode 1 foot, value 10 dwts. 21 grains. 760 feet level north advanced 13 feet 3 inches, total 85 feet. Lode 1 foot, value 14 dwts. 4 grains. 660 feet level south advanced 26 feet 3 inches, total 493 feet 9 inches. Lode 1 foot, value 1 ounce 17 grains. No. 1 winze 660 feet level south sunk 3 feet 3 inches, total 50 feet. Lode 2 feet, value 9 dwts. 19 grains. No. 2 winze same level sunk 3 feet 9 inches, total 31 feet 3 inches. Lode 9 inches, value 15 dwts. 6 gra. No. 3 winze sunk 4 feet 6 inches, total 14 feet 3 inches. Lode 6 inches, value 16 dwts. 8 grains. No. 1 winze 660 feet level north sunk 4 feet 3 inches, total 41 feet 9 inches. Lode 3 feet 6 inches, value 2 ounces 6 grains. 560 feet level south advanced 20 feet 3 inches, total 854 feet 3 inches. Lode 1 foot 6 inches, value 2 ounces 3 dwts. 13 grains. No. 2 winze 560 feet level south sunk 3 feet, total 59 feet 9 inches. Lode 6 inches, value 17 dwts. 15 grains. No. 3 winze same level sunk 1 foot, total 47 feet 6 inches. Lode 1 foot, value 9 dwts. 19 grains. No. 4 winze sunk 2 feet 3 inches, total 55 feet 3 inches. Lode 2 feet 6 inches, value 1 ounce 2 dwts. 21 grains. No. 5 winze sunk 5 feet 9 inches, total 52 feet. Lode 3 feet, value 1 ounce 12 dwts. 16 grains. No. 6 winze sunk 6 feet, total 47 feet 9 inches. Lode 6 inches, value 1 ounce 1 dwt. 19 grains. No. 3 winze 460 feet level south sunk 4 feet 9 inches, total 44 feet 9 inches. Lode 1 foot, value 2 ounces 5 dwts. 17 grains. No. 6 winze same level sunk 6 feet 3 inches, total 84 feet 6 inches. Lode 2 feet, value 1 ounce 17 grains. No. 7 winze sunk 3 feet 9 inches, total 78 feet 3 inches. Lode 1 foot 6 inches, value 16 dwts. 8 grains. 215 feet level north advanced 22 feet 3 inches, total 340 feet. Lode 1 foot, value 1 ounce 12 dwts. 16 grains. Incline winze on point of fold 215 feet level north sunk 26 feet, total 50 feet. Lode 2 feet 6 inches, assaying 1 ounce 15 dwts. Low's shaft has been sunk 6 feet, total 563 feet 10 inches. 510 feet level south advanced 4 feet 6 inches, total 117 feet. No lode. Level north on branch in cross cut west from 510 feet level commenced, 5 feet driven. Lode 4 inches wide, assaying 12 dwts. per ton. Probyn's shaft sunk 7 feet 8 inches, total 960 feet 12 inches. 950 feet level south advanced 14 feet 6 inches, total 81 feet. We have intersected the lode in this end. It is 1 foot wide, assaying 1 ounce 20 grains. No. 1 winze 950 feet level north sunk 6 feet, total 23 feet 6 inches. Lode 9 inches, value 8 dwts. 17 grains. 850 feet level south advanced 12 feet 6 inches, total 220 feet. No lode. No. 1 winze 850 feet level south sunk 6 feet, total 36 feet 6 inches. Lode 1 foot 2 inches, value 6 dwts. 12 grains. No. 1 rise 850 feet level south 9 feet 6 inches risen, total 43 feet. Lode 1 foot 3 inches, value 5 dwts. 10 grains. No. 2 winze 650 feet level south sunk 2 feet 6 inches, total 55 feet 6 inches. No lode. No. 2 Trial shaft sunk 6 feet, total 228 feet 9 inches. Lode 4 feet, value 1 ounce 12 dwts. 16 grains. The stopes, 43 in number, will be measured and reported at the end of month. The erection of No. 3 mill is nearly completed. We hope to start it for a trial this week.

**OURO PRETO.**—Passagem Mine: Incline shaft No. 1: Sinking was resumed for another level, and shaft was sunk 150 metres. A bunch of quartz is standing in south west end, but breast of incline is mostly in quartzite. Incline shaft No. 2 was sunk 390 metres. The upper part of the breast is now in quartzite; low grade ore continuing along the floor. 470 end north east was driven 470 metres. The ore has dipped under the floor of the level, and the breast is mostly in schist. 470 end south west was driven 465 metres in schist without ore. 435 end north east was driven 610 metres, and has again resumed its former value, quartz carrying pyritic and tourmaline ore standing full size of the heading. Cross cut from 435 north east was driven 3 metres, still in extremely hard itabirite. End from stope 435 north east was driven 4 metres, and has holed through a pillar to the rise. The lode from the rise to end of stope, a length of over 30 metres, is of fine massive appearance, and over 4 metres thick in the breast. 400 end north east was driven 620 metres. The branch against the roof has increased in size, being now over 1 metre thick, but lower part of end continues in quartz. End from stope at 400 north east was driven 490 metres. It is following a branch going off diagonally from main lode, and is full size in quartz. 400 end south west was driven 260 metres in schist without ore. 365 end north east was driven 480 metres, full size, in strong lode of good quality quartz. End south west from No. 2 cross cut at 365 north east was driven 540 metres. The lode here also is full size of the end, and composed chiefly of quartz, but of good yield. End north east from No. 1 cross cut was driven 5 metres on the same body of ore as the end just mentioned, though through being more in the lower part of the ore body, it carries more quartzite and schist. Rise from stope over 365 north-east was advanced 6 metres, and is expected shortly to hole to stopes under 315 to facilitate working. The lode as in the stopes above and below is about 3 metres thick, and of good quality, and average assay giving about 20 grammes per ton. 365 end south west was driven 5 metres. Schist is still found along floor of level, but the greater part of the end is now in lode composed of quartz with tourmaline ore. 315 end north-east was driven 490 metres. The quartz has bent over leaving the end in quartzite. A crosscut will now be started a little further back to test the size and value of the ore lately passed through. 315 end south-west was driven 670 metres. The lode has opened out again, and the end is full size in quartz, carrying a little schist with tourmaline ore. Rise over 315 south-west was driven 620 metres, but at present carries only a branch of ore about 80 centimetres thick against the roof. 215 end north-east, driving has commenced at this level to explore for north-east ore shoot met at 315 level. It was advanced 110 metres. 175 end south-west was driven 310 metres in schist.—Stopping: The new stopes between 315 and 365 levels north-east continue to open out well, and produce ore of very good quality. The lode at times carries bars of quartzite and schist, but not more than can be stowed away in filling behind, and the quartz averages about 3 metres thickness. The 400 stopes continue very productive, and show little change, except in the north east stope nearest No. 2 shaft. The lode in this stope is at its south west end over 5 metres thick, but in the north east end there is hardly any ore, the lode coming against a slide and being forced under the floor by a thick mass of quartzite. A vertical branch of quartz holding up through the quartzite is being followed by an end to see if the ore turns upwards again. The face of the new stopes at 435 north east presents a fine strong appearance, the quartz being over 4 metres thick with no sterile rock whatever. Over the 235 south west stopes have been put through pillars of lode to the 215 level, and have produced a good quantity of fair quality ore, but the remaining pillars will now have to be left to support the roof. Over the 265 south west a large amount of ground was broken, but the lode carries a very large proportion of schist, which has to be broken on account of a good branch against the roof and another against the footwall. The stopes from level over 365 south west show the lode about 4 metres thick, but a piece of sterile ground has appeared in the middle, and is being left as a pillar. At each end the lode continues productive, carrying a fair amount of pyrites.

**SUTHERLAND REEF.**—The mine manager reported on April 19: I have completed the cutting out of the station as I informed you in my last letter, and have driven in on the west drive about 12 feet at this (150 feet) level. The reef looks very promising in this drive so far as we have gone. As I informed you in my last, we have had a good deal of rock at this level, and, as you know, the gear we have at present is very slow in hoisting; as soon as I get the stuff cleared from this level I shall again start cutting down the shaft. The health of all the camp is excellent. I have a full supply of native labour.



## RECENT TRIALS OF A NEW MODE OF TIN DRESSING AT BOTALLACK.

THE REPORT OF MR. R. V. WILLIAMS.

(FROM THE *Cornishman*.)

THE following report on an improved and economical method of tin dressing was sent the pursuer, Mr. James, previous to last week's meeting of shareholders. In the long discussion on the best means of developing the mine underground, and of fresh economies at surface, Mr. Williams' report was overlooked. We give it because it has an interest for county, as well as Botallack, tin dressing:—

GENTLEMEN,—I beg to send you the following report upon the new jiggers, separators, and Spitzkastens erected at your mine, being part of a modern tin dressing plant, which, after being partly adjusted, I worked a total of 27 hours during six consecutive days, being rather a short trial run, but quite sufficient to prove, beyond all doubt, that these different appliances combined are very important factors indeed, towards solving the all-important questions of cost of treatment and saving more tin per ton of stuff dressed.

During the total of 27 hours' run I received from day to day various kinds of tin stuff from 16 heads of stampers. A portion of this stuff, I have been given to understand, was the poorest of your mine, averaging on the whole about 1½ per cent. of black tin per 100 tons of stuff crushed. This, as discharged from the stamps, was conveyed direct by launders to one double V separator, and, in passing through this, the slimes were separated from the coarser portions by the aid of one hydraulic pipe of water, being equal to about 1½ pipe capacity. Seeing that the separation from the full discharge of 16 heads of stampers was so perfectly effected by so little water needs no further comment.

The slimes, once separated from the coarser portions, continue to flow onward until it reaches the first Spitzkasten I erected (and since adopted by the manager to supply rotary tables situated down the hill from the main dressing floors), and from this Spitzkasten one convex buddle was fed, receiving the slimes of first, second, and third grades, mixed together; and, after running as afore stated a total of 27 hours, and seeing it required from 12 to 14 hours more to fill this buddle, it was evident that about 60 per cent. of the whole stuff crushed was contained in the coarse portions supplying the jiggers; as in running direct from the stampers into one buddle, having in the usual way slimes and coarse mixed all together, it takes from 18 to 20 hours to fill.

SPITZKASTEN.—This is a modern classifier, and can be adopted to great advantage in various ways, and especially as a slime collector and separator. In order to produce three distinct grades of slimes, as intended at Botallack, three different size Spitzkastens must be used, collecting at the bottom of the first No. 1 grade slimes, ditto the second No. 2 grade slimes, and the third No. 3 grade slimes. First grade slimes to be treated in convex buddles, second grade slimes by rotary tables suitably designed, third grade slimes by dead frames; and in this way, continuing the work automatically, the slimes will be practically unsorted, leaving a rich residue to be transferred to the dressing floors and calcination works, returning again to No. 1 slimes and others mixed together, as fed from the one Spitzkasten into the convex buddle. The head part of this buddle, for about 1 foot wide, was found sufficiently rich to be taken direct to the calciner, which, as per average samples taken and assayed at Chyan-dour Smelting Works, yielded from 50 to 60 per cent. of pyrites, containing 11 per cent. of black tin.

The middle part of this buddle was thrown out and rebuddled, resulting in the head part of this yielding by assay much the same as the first buddle head; whilst the tail part of this, and also the tail part of the second buddle, from a length of 3 feet and 4 feet respectively, were both pronounced by your foreman as being worthless, and accordingly thrown away. And from samples of these tailings I took, and since assayed, I can only confirm your foreman's statement. Seeing that the buddling of the middle head was done by one little boy in about two hours and produced such good results, it must be taken as an example of what can be achieved on a large scale, and as great reduction of cost in any well regulated works.

JIGGERS.—In the working of these I direct your attention to the first separation, by which nearly 50 per cent. of the coarser portions of the whole are passed direct to jiggers, consisting of three sieves in each line, of which there are four lines, two only being required for 16 heads of stampers, in the event of a full and proper plant of appliances being available to continue the work automatically in dressing up the various grade slimes. Direct from the first separation the first sieves are fed automatically and continued discharging at the end of the third sieves; about four-fifths of the stuff treated containing only a trace of minerals, as per sample taken. As a safeguard against starting, stopping of stampers, and other minor causes, sand buddles, as per plans laid before the manager, should be erected. This being done, no loss of the least possible importance could occur; which would be quite a different thing from the escape at your works hitherto, and even at present, as per samples taken. The ore, in passing over the sieves, filters through a bed of coarse grain tin and fine wire gauze, and is deposited in three separate boxes; the first box having the bulk of the ore, second less, and third very poor, all being of different grades perfectly sized.

During the 27 hours' run the contents of three or four of the second boxes, with all the first boxes, were put together, and also buddled together, and from the head of this buddle a fair average sample was taken and assayed, yielding from 70 to 75 per cent. of pyrites, containing from 22 to 24 per cent. of black tin, whilst the tail part of this buddle, composed mainly of heavy lode gangue, in which fine grains of tin ore are embedded, not sufficiently reduced, yielded by assay from 9 lbs. to 12 lbs. of tin ore to the ton of tailings. And as there is also in these tailings a lighter free sand, the bulk can, by a very simple operation, be reduced, leaving a payable residue to be again crushed more finely, rendering the tin ore free from the heavy gangue.

The tin ore extracted from the jigger concentrates were, at Chyan-dour Works, converted into metal, which is of a much finer quality than the finest metal produced from your ore, as delivered at the smelting works from time to time, which opens up new fields at your mine for careful experiments in the dressing of the tin ore.

Considering the results obtained from separation and jigging, also results obtained from samples taken of the various classes of concentrates produced during the short trial run, and since carefully assayed, I pronounce the whole thing a great success, and such as will very materially assist Cornish tin dressing—if only fully and carefully carried out upon a proper basis. And in favour of this Nature has done a great deal for you in the way of a most beautiful site—such as you can well work automatically from start to finish.

It has been said that jigging is better adapted for mines having lodes of a porphyritic matrix, impregnated with coarse grains of tin ore, but even under such conditions (which I have often worked) I have not, on the whole, seen better results

than those obtained at your mine in extracting pyrites from chlorite gangue having a small percentage of silica.

In stamping your stuff it produces a large percentage of slimes, which, however, separates from the coarser portions freely and well; therefore, there are not any particular disadvantages, as, once you effect a perfect separation and classification of the different grades, it proves that the specific gravity of the ores and gangue are amenable to the laws of separation, pure and simple. And to continue this work it is absolutely only a matter of laying out a well-designed dressing-plant.

As a more reasonable objection, it has been stated that jiggers require more water than in the ordinary way of Cornish dressing, which, to a certain extent, is perfectly true. Yet, against this, it must be remembered, actual dressing at your mine does not in reality commence until after the first buddling direct from the stamps, and from this, in dressing up preparatory to calcination, the consumption of water and labour are heavy items, as the whole work is often repeated, necessitating an endless supply of water, shovelling, wheeling, &c.; whereas, against this, under a well conducted system of separation, jigging, and other necessary automatic machinery, the dressing up work would be reduced, from a manual labour point of view, 50 per cent., and in this ratio the consumption of water would also be reduced. And as there is at all times water flowing away from the dressing floors to the Atlantic, it is a small matter of cost to pump it back again, keeping up at all times a bountiful supply for all purposes.

In conclusion, I may mention that if your company could see their way clearly to grant a fairly long term for the whole of their tin dressing, and guarantee a given quantity of crude tin stone of a fair average quality, I, with others, would consider the matter of erecting a dressing plant in part, and re-arranging the present plant, based upon your average cost per ton of stone crushed, tin saved, and tin lost.

## GEOLOGY AND MINERALOGY OF SHASTA COUNTY.

By HAROLD W. FAIRBANKS, F.G.S.A.

From the California State Mineralogist.

V.

(Continued from page 498.)

BELOW the Afterthought Mine, to the point where the road leaves the creek, the formation is chiefly a dark quartz porphyry. What is known as the Backbone Road follows down the divide between Cow Creek and Pitt River. The ridge is high and narrow, with a very abrupt descent to the river. The highest point of this ridge for a mile consists of gray and black slate; strike north 30 degrees to 40 degrees west dip vertical. Farther west the ridge is covered with lava, but there are occasional outcrops of the older series. This underlying rock is generally a dark flinty one, often with minute crystals of feldspar, and a flowage structure much resembling an ancient lava. North-west of the lower end of the Reed Toll Road, the rock, where not covered by lava, is a massive green one, with traces of a porphyritic structure. It is undoubtedly an intrusive porphyry. The Reed Road after leaving Cow Creek passes over lava tuffs for several miles. West of this blocky argillites are met; strike north 30 degrees to 40 degrees west, dip 50 degrees north-east. These are followed by a mile of dark crystalline rock which is overlaid by Chico sandstones on the west. The sandstone is replaced by shale towards the mouth of Cow Creek. These shales, wherever exposed in the foothills, form a heavy adobe soil.

### Characteristic Fossils.

are abundant. The sandstone is but scantily covered with soil, and weathers out in great knobs and dome-shaped masses. On Dry Creek the shales are well exposed, showing a dip from 5 degrees to 80 degrees and numerous faults. Sandstone carrying an abundance of fossils outcrops on Stinking Creek. Near the mouth of the creek numerous brackish sulphur springs break up. The water is very disagreeable to the taste, and deposits both salt and sulphur. This region was recently the scene of a petroleum excitement, but no trace of oil could be found. The sandstone rises northward in higher barren ridges for a mile, and terminates in a conglomerate resting on the metamorphic series. The latter consist of slates, which strike north and south, dip 30 degrees to the west. They are black, hard, and jointed, and cut by dioritic dykes. Farther north, in a gulch which heads in Bare Mountain, the slates are extremely metamorphosed; strike west 15 degrees south, dip 80 degrees south. Dioritic dykes continue to be numerous. Up the gulch as far as the Copper City Road the diorite porphyritic dykes continue. Their outlines are very irregular, and they often appear as mere bunches, but preserve a general north-west and south-east direction. The slates, as a whole, are so metamorphosed that there is no noticeable contact phenomena. The strike is north to north 15 degrees west, dip 20 degrees to 30 degrees west, for two miles south-west of Bare Mountain. It is probable that granite underlies this region at no great depth, and that the numerous porphyritic dykes are offshoots.

Between Bare Mountain and Silverthorn Ferry argillites are the prevailing rock. They lie nearly flat. At the river the strike is north 40 degrees west, dip 40 degrees south-west. Thin strata of limestone are occasionally seen. Between Copper City and the ferry, the rocks, though greatly broken, strike north-west and dip south-west.

It is difficult to give an intelligible description of

### The Mines about Copper City.

It has been many years since any work has been done here, and the old workings are inaccessible. The great excitement occurred in 1862-63. Mills were afterwards erected, and as the ore appeared to be present in inexhaustible quantities no regular system of development was entered upon, but it was obtained in the easiest possible way, generally from surface openings. The ore is what might be termed medium grade, carrying both silver and gold. When the decomposed portions were reached, which was generally but a short distance down, the free milling processes were of no use; and after an attempt to remodel the works so as to adapt them to a reduction of base ores they were wholly abandoned. At the time of my visit only a few prospectors were at work on Bully Hill and vicinity, and a part of these were engaged in placer mining.

The mineral deposits at Copper City occur generally in a felspar porphyry, which has been intruded through the slates in great masses, and not in the narrow dyke form. There is not much regularity about these bunches, and the slates in consequence dip and strike in every direction. The mineralisation is no more regular than the geological features. The ore bodies are not veins in the usual sense of the term. The only veins in the district are quartz; and they are barren. The ore occurs, however, in irregularly mineralised areas in the porphyry. These

might be termed chimneys, and are in all probability as permanent in their downward continuation as

### Fissure Veins.

but far more irregular. The body of porphyry at Copper City containing the ore deposits extends northerly, though not continuous, about 2 miles, terminating in dykes. These bodies of porphyry are generally elongated in a north-west direction. The mineralisation in this district shows feebly as far south as Silverthorn Ferry, and northward it does not extend much beyond Bully Hill. It is not certainly known whether this porphyry is a part of that great area extending in a westerly direction from the Peck Mine. There is certainly no prominent mineral deposit in the intervening region. The porphyry at Copper City often presents that tuffaceous character noted in other places, and the origin of which is so puzzling. The ore is gray copper, containing gold, silver, antimony, and copper. Zinc blende and galena are often present, and also iron and copper sulphurets. On the surface the mineralised areas are represented by a red spongy mass, in which the gold is free, or partly so, the other minerals being reduced to carbonates or oxides. The character of the ore is much the same as that at the Peck and Afterthought Mines. The gangue contains no quartz, but instead a large quantity of heavy spar and calcitic compounds derived from the alteration of the porphyry.

A great amount of work was done on

### The Excelsior Mine

at Copper City. Two tunnels, one 1100 feet, the other 400, were run without striking the ore, and a shaft was sunk 125 feet on the top of the hill. Beautiful specimens of native silver were found near the surface in this mine when first opened. The mine is said to have been abandoned on the supposition that it was worked out, but I see no reason for thinking that the deposits are on the surface merely. The ore in this mine was characterised by a large amount of zinc blende.

The Exeter Mine was opened to a depth of 60 feet. The body of ore opened up is supposed to be better defined than most of the deposits in this district. All the ore mined was taken from near the surface, where it was easily worked. The direction of the ledges is north-west and south-east, but it is not likely that this regularity continues far.

Bully Hill lies about two miles north of Copper City. It is a great mass of mineralised felspar porphyry, red, and easily decomposed on the surface. The red gossan capping is distinguishable from a long distance. The surface has been worked off and milled over a considerable area, and the gulches below, though worked for years, still contain much placer gold. Everywhere the hill seems to have been worked down to the undecomposed ore, and then abandoned.

### The Jenny June Mine

has a shaft down 100 feet. Most of the work was done on the mine in 1862, when a tunnel 1000 feet long was run. The ore is not as base as in most of the mines.

The Popejoy Mine has been opened by a tunnel and shaft. A large body of ore was struck in this mine, but only the decomposed portion was touched.

The Recorder Mine lies on the north side of Bully Hill. A 200 feet tunnel has been run, and a body of almost pure copper sulphurets struck. The Bully Hill ores are, as a rule, easier to work than those at Copper City.

In summing up the characteristics of this district it may be said that the amount of ore is immense, but it is medium low grade with rich spots; that, while it has paid abundantly near the surface, no method has yet been successful with the base, undecomposed ores. Carrying as they do gold, silver, and copper, some method will yet be devised to reduce them on a paying basis.

Between Bully Hill and Madison's, five miles above, on Squaw Creek, slaty rocks are the only ones seen. In fact, up Squaw Creek, nearly to the boundary of the county, no more intrusive rocks appear.

(To be continued.)

## CARBOLINEUM AVENARIUS.

CARBOLINEUM AVENARIUS is the name of a comparatively new preservative for wood, ropes, and stone, and is now attracting much favourable attention. Its principle is a simple one, and susceptible of a broad application. The substances entering largely into the construction of all kinds of industrial and other buildings are simply coated once or twice with the composition, and thus rendered largely impervious to the decaying influences of dampness and rot. To instance the extended sphere of its utility, it may be mentioned that boots are among the articles for which its use is advocated.

But it is for wood that carbolineum is chiefly recommended. By its own action it penetrates into the wood, drives out the moisture, and makes it impervious to damp. Its advantage over other preservative compounds is that while doing this it does not stop up the pores of the wood and occasion dry rot. The sap of the wood is thoroughly permeated with the preparation, and hardens them, thus converting what may be called a weak part into one of the strongest parts of the timber. Even where decay is somewhat advanced, carbolineum arrests it, and thus makes the wood much more durable.

Among the directions in which it is said that carbolineum can be advantageously used may be mentioned sheds, platforms, bridges, landing stages, poles, posts, fences, timber in mines, in ships, and in boats. Should its efficacy in these particulars justify the hopes entertained of it, an extremely useful preservative will be added to the resources of the modern workshop.

WEST OF SCOTLAND MINING INSPECTOR'S REPORTS.—The report of the Inspector of Mines for the West of Scotland district has just been issued. The total number of persons employed was 37,589. Whilst there is a decrease of 163 during the year of the number of persons employed below ground, there is an increase of 23 persons employed above ground, and this increase is entirely caused by the number of additional boys, girls, and women employed. This is due to the introduction of cleaning coal by hand picking, and for this purpose female labour is being more extensively taken advantage of than hitherto. The report for 1893 of Mr. J. Atkinson, Inspector of Mines for the Eastern District of Scotland, has been issued as a Parliamentary paper. The number of persons employed under the Coal Mines Regulation Act of 1857 and the Metalliferous Mines Regulation Act of 1872 is given as 53,892; the minerals raised as 17,503,139 tons; the number of fatal accidents in the mines of the district as 61, and the number of deaths as 95. The number of persons employed, and the quantity of minerals raised, are both less than the corresponding figures for the preceding year, but fatal accidents and deaths have diminished in still greater ratio.

SCOTTISH COAL INDUSTRY.—The miners in Carlislework, Tranent district of the Lothian Federation, resumed work on Wednesday on an advance of 1d. per ton in lieu of crushing, although their arbiters claimed 1½d., which was refused. It is stated that large quantities of Scotch coal are being sent to America owing to the miners' strike. There are further enquiries in the Glasgow market.



# PROVINCIAL SHARE MARKETS.

## THE CORNISH MINE SHARE MARKET.

**M**R. SAMUEL JOHN DAVEY, Dealer in Cornish Mine Shares, Redruth, Cornwall, reports under date of May 17 (4 o'clock) as follows:—We have had a very quiet market this week, and business was interrupted by the holidays. Market is inactive to-day. Following are quotations:—Blue Hills,  $\frac{1}{2}$  to  $\frac{3}{4}$ ; Carn Brea,  $10\frac{1}{2}$  to 11; Cook's Kitchen,  $\frac{3}{4}$  to  $\frac{5}{8}$ ; Dolcoath,  $7\frac{1}{2}$  to  $7\frac{3}{4}$ ; East Pool,  $10\frac{1}{2}$  to 11; Killfret,  $8\frac{1}{2}$  to  $8\frac{3}{4}$ ; South Condurrow,  $\frac{1}{2}$  to  $\frac{3}{4}$ ; South Crofty,  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; South Wheal Frances,  $1\frac{1}{2}$  to  $1\frac{3}{4}$ ; Tincroft,  $12\frac{1}{2}$  to  $12\frac{3}{4}$ ; West Frances,  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; West Kitty,  $6\frac{1}{2}$  to  $7$ ; Wheal Agar,  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; Wheal Bassett,  $2\frac{1}{2}$  to  $3$ ; Wheal Grenville,  $18$  to  $19$ ; Wheal Kitty (St. Agnes),  $\frac{1}{2}$  to  $\frac{3}{4}$ ; Polberro,  $1$  to  $1\frac{1}{2}$ .

**M**R. MICHAEL WILLIAMS BAWDEN, Mining and Assaying Offices, Liskeard, Cornwall, writes (May 17) as follows:—The mining market has undergone the usual quietude during the Whitsun recess, and prices are almost stationary, with but a very limited amount of business done. The following are closing prices:—Blue Hills,  $6\frac{1}{2}$  to  $7\frac{1}{2}$ ; Carn Brea,  $10\frac{1}{2}$  to  $10\frac{3}{4}$ ; Cook's Kitchen,  $\frac{1}{2}$  to  $1$ ; Devon Consols,  $\frac{1}{2}$  to  $1$ ; Dolcoath,  $7\frac{1}{2}$  to  $7\frac{3}{4}$ ; East Pool,  $10\frac{1}{2}$  to  $10\frac{3}{4}$ ; Killfret,  $8\frac{1}{2}$  to  $8\frac{3}{4}$ ; Phoenix United,  $\frac{1}{2}$  to  $\frac{3}{4}$ ; Polberro,  $\frac{1}{2}$  to  $1$ ; South Crofty,  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; South Frances, c.p.,  $1\frac{1}{2}$  to  $1\frac{3}{4}$ ; Tincroft,  $12\frac{1}{2}$  to  $12\frac{3}{4}$ ; West Frances,  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; West Kitty,  $6\frac{1}{2}$  to  $6\frac{3}{4}$ ; Wheal Bassett,  $3$  to  $3\frac{1}{2}$ ; Wheal Grenville,  $18\frac{1}{2}$  to  $18\frac{3}{4}$ .

**M**ESSRS. ABBOTT AND WICKETT, Stock and Share Brokers, and Mining Share Dealers, Redruth, write under date of Thursday, May 17:—The Cornish Share Market has been very quiet during the past week, and transactions have been generally of a limited nature, the chief dealings being in Dolcoath, Killfret, and West Kitty. Closing quotations here (four o'clock):—Blue Hills,  $\frac{1}{2}$  to  $\frac{3}{4}$ ; Carn Brea,  $10\frac{1}{2}$  to  $11$ ; Cook's Kitchen,  $\frac{1}{2}$  to  $\frac{3}{4}$ ; Dolcoath,  $7\frac{1}{2}$  to  $7\frac{3}{4}$ ; East Pool,  $10\frac{1}{2}$  to  $10\frac{3}{4}$ ; Killfret,  $8\frac{1}{2}$  to  $8\frac{3}{4}$ ; Phoenix,  $\frac{1}{2}$  to  $\frac{3}{4}$ ; Polberro,  $1$  to  $1\frac{1}{2}$ ; South Condurrow,  $\frac{1}{2}$  to  $\frac{3}{4}$ ; South Crofty,  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; South Frances,  $1\frac{1}{2}$  to  $1\frac{3}{4}$ ; Tincroft,  $12\frac{1}{2}$  to  $12\frac{3}{4}$ ; West Frances,  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; West Kitty,  $6\frac{1}{2}$  to  $7$ ; Wheal Agar,  $2\frac{1}{2}$  to  $2\frac{3}{4}$ ; Wheal Bassett,  $2\frac{1}{2}$  to  $3$ ; Wheal Grenville,  $18$  to  $19$ ; Wheal Kitty,  $\frac{1}{2}$  to  $\frac{3}{4}$ . Tin,  $70\frac{1}{2}$ .

## MANCHESTER.

**M**ESSRS. JOSEPH R. and W. P. BAINES, Stock and Share Brokers, Queen's Chambers, 7, Market-street, write, May 17, 1894 (noon):—As usual in Whit week we do not propose to make any attempt at report this week. Changes are only reflections of dealings, and movements in other markets, for what with the usual Whit week carnival and the approaching Royal visit, which entails a further holiday for Monday next, there is not enough doing here to lend any colour to quotations. Consols are just the turn better. With one or two exceptions, home rails are better, but not greatly altered, excepting for York A, which have further advanced over 2 per cent. In Canadian, Pacific are unaltered, but Trunk issues are all more or less down. In American, prices in many cases are distinctly down, several a couple of dollars, and others with falls of small amounts. Just here and there prices are maintained, but it seems more from absence of business in the particular stocks that they remain nominally unchanged. Ship Canal shares have fallen away again, but are fairly steady at the lower prices. We do not analyse any movements in local or other miscellaneous classes. Business closes each day here this week (from yesterday inclusive) at 12.0 noon, so there is no later report to provide.

## SCOTCH MINING AND INDUSTRIAL COMPANIES SHARE MARKETS.

**S**TIRLING.—**M**R. J. GRANT MACLEAN, Stockbroker and Ironbroker (May 17), writes:—During the past week business has been interrupted by the Whitsun holidays, but prices have in some cases improved. The metal markets continue active. The Money Market is very easy, and trade prospects are still regarded hopefully.

In shares of coal, iron, and steel companies prices are firm. Dolcoath Vaghan are at  $10\frac{1}{2}$ ; Ebbw Vale,  $9\frac{1}{2}$ ; Niddrie Coal,  $49\frac{1}{2}$ ; Steel Company of Scotland,  $58\frac{1}{2}$ ; Stewart and Clydesdale,  $8\frac{1}{2}$ ; and Wilsons and Clyde,  $9\frac{1}{2}$ .

In shares of copper concerns there is not much business doing, and prices are easier, in sympathy with the market for the metal. Thais have declined to  $92\frac{1}{2}$ , and Tinto to  $14\frac{1}{2}$ . Cape and Mason unaltered. Rio Tinto Second Mortgage are at  $102\frac{1}{2}$ .

In shares of gold and silver mines there has been less business doing. Montana easier at  $5\frac{1}{2}$ . The return of the Mosman Company shows the gold sales last year were £30,560, but the profit only £2312. The heavy cost of the working at the mine is ascribed to the narrowness of the reef, but the London costs are also very high. The mine manager's report states the future of the mine is expected to be good. The Bonnie Dundee return shows £1135 profit. In the case of this mine it is expected three reefs will be met with soon, and enable dividends to be resumed. African Recovery Company shares firmer on the announcement that 56,500 ounces being 29 per cent. of the Randt output for April have been obtained by their process. The Frontino Company's return for last month is very good, the profit estimated at £2481. British South Africa Chartered are at  $32\frac{1}{2}$ . Broken Hill Proprietary,  $61\frac{1}{2}$ ; Bayley's Reward,  $17\frac{1}{2}$ ; Champion Reef,  $79\frac{1}{2}$ ; Consolidated Gold Fields of South Africa,  $46\frac{1}{2}$ ; Caratal,  $7\frac{1}{2}$ ; Cassel,  $17\frac{1}{2}$ ; Day Dawn P.O.,  $4\frac{1}{2}$ ; Gold Fields of Mysore,  $24\frac{1}{2}$ ; Lisbon Berlyn,  $3\frac{1}{2}$ ; May Consolidated,  $9\frac{1}{2}$ ; New Virginia Transvaal,  $3\frac{1}{2}$ ; New Guston,  $12\frac{1}{2}$ ; New Queen,  $7\frac{1}{2}$ ; Orita,  $2\frac{1}{2}$ ; Parley's Mozambique,  $18\frac{1}{2}$ ; Sheba,  $28\frac{1}{2}$ ; Sutherland Reef,  $4\frac{1}{2}$ ; South Simmer and Jack,  $27\frac{1}{2}$ ; to 30.

In shares of miscellaneous companies prices are steady. In Oil companies shares the tendency is upwards, Broxburn being at  $8\frac{1}{2}$ , and Young's  $28\frac{1}{2}$ . Law's Chemical are at  $6\frac{1}{2}$  to  $6\frac{3}{4}$ ; Nobel's Explosive,  $13\frac{1}{2}$ , and White Lead,  $4\frac{1}{2}$  to  $5\frac{1}{2}$ .

## EDINBURGH.

**M**ESSRS. THOMAS MILLER and SONS, Stock and Share Brokers, 69, Hanover-street, Edinburgh, report as follows under date of May 17: Home railway stocks have been well supported and leave off strong. Caledonian Deferred has risen from  $45\frac{1}{2}$  to  $46$ , North British from  $41\frac{1}{2}$  to  $41\frac{3}{4}$ , Glasgow and South Western from  $104\frac{1}{2}$  to  $106$ , Highland from  $112$  to  $112\frac{1}{2}$ , Great Northern Deferred from  $61\frac{1}{2}$  to  $63\frac{1}{2}$ , Brighton Deferred from  $153\frac{1}{2}$  to  $155$ , South Eastern Deferred from  $81\frac{1}{2}$  to  $82$ , Sheffield Deferred from  $80$  to  $80\frac{1}{2}$ , North Eastern from  $164\frac{1}{2}$  to  $165\frac{1}{2}$ . Debenture and other high class stocks have been taken at improved prices. Canadians and Americans depressed, but close firm at the reduced prices. Royal Bank has advanced from  $230$  to  $234$ , National from  $331$  to  $332$ , British Linen from  $383$  to  $384$ , Commercial from  $67\frac{1}{2}$  to  $67\frac{3}{4}$ . Insurance shares generally better. North British and Mercantile have advanced from  $35\frac{1}{2}$  to  $36$ , Life Association from  $37\frac{1}{2}$  to  $38$ , Royal from  $47$  to  $47\frac{1}{2}$ , Standard Life from  $58\frac{1}{2}$  to  $58\frac{3}{4}$ , Scottish Union and National A from  $77\frac{1}{2}$  to  $78$ , Northern from  $63\frac{1}{2}$  to  $65$ . American Mortgage of Scotland shares have receded from  $4\frac{1}{2}$  to  $4\frac{1}{4}$ , Colorado Mortgage and Investment from  $90\frac{1}{2}$  to  $89\frac{1}{2}$ , Niddrie and Benhar Coal have risen from  $45\frac{1}{2}$  to  $47\frac{1}{2}$ , Lochore and Caplethrae have fallen from  $22\frac{1}{2}$  to  $20\frac{1}{2}$ , and the preference shares from  $7\frac{1}{2}$  to  $7$ . Broxburn Oil have risen from  $8\frac{1}{2}$  to  $8\frac{3}{4}$ . Allsopp have advanced from  $110\frac{1}{2}$  to  $119$ , Distillers from  $15\frac{1}{2}$  to  $15\frac{3}{4}$ , Edinburgh United Breweries from  $70\frac{1}{2}$  to  $82\frac{1}{2}$ , McEwan Preference from  $13$  to  $13\frac{1}{2}$ . Coats 1s. 3d. lower at  $17\frac{1}{2}$ . Edinburgh Tramways 4s. 9d. higher at  $99\frac{1}{2}$ .

**C**OAL IN THE EASTERN COUNTIES.—The directors of the Eastern Counties Coal Boring Association have recommended the shareholders to empower them to proceed to make one or more bores with the funds at present available, in order to ascertain the existence or non-existence of coal at the spot which has been indicated

by the geologists consulted. It was originally intended that at least £5000 should be subscribed before such an attempt was made, but only £2560 has been unconditionally subscribed. The geologists have indicated the parish of Stetton, in Suffolk, on the north bank of the River Stour, as the best place for the first operations, and the directors state that the landowners in the parish have consented to the borings being made on their land, and have expressed their willingness to enter into an agreement by which, should coal eventually be worked on their estate, they would receive royalties to a limited amount spread over a period of time. The directors hope in future to complete arrangements more favourable to the shareholders.

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## COMPANIES AND LEGAL ANNOUNCEMENTS.

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### PATENTS, DESIGNS, AND TRADE MARKS' ACTS, 1883 to 1888.

**N**OTICE IS HEREBY GIVEN, that ARTHUR HENRY STOKES of Green Hill, Derby, Co. Derby, has applied for leave to amend the Specification filed in pursuance of the Application for Letters Patent, No. 6363 of 1893, for "A Fire Damp Testing Safety Lamp."

Particulars of the proposed amendments were set forth in the Illustrated Official Journal (Patents) issued on the 9th May, 1894. Any person or persons may give notice (on Form G), at the Patent Office, 25, Southampton Buildings, London, W.C., of opposition to the amendment within one calendar month from the date of the said Journal.

(Signed) H. READER LACK, Comptroller-General.

Messrs. Allison Bros., Patent Agents, 52, Chancery Lane, W.C.

### NERBUDDA COAL AND IRON COMPANY (LIMITED).

**N**OTICE IS HEREBY GIVEN, that the THIRTY-FOURTH ORDINARY GENERAL MEETING of the Company will be held at the Offices of the Company, 213, Gresham House, Old Broad Street, London, E.C., on TUESDAY, the 29th instant, at 12 o'clock noon, for the Transaction of the General Business of the Company, including the Election of Directors and Auditor.

The Transfer Books will be closed from Saturday, the 19th, to Tuesday, the 29th instant, both days inclusive.

By order of the Board.

FREDK. R. BLUETT, Secretary.

213, Gresham House, Old Broad Street, E.C., May 9th, 1894.

### GLENCAIRN MAIN REEF GOLD MINING COMPANY (LIMITED).

#### INCREASE OF CAPITAL.

**N**OTICE IS HEREBY GIVEN, that the DIRECTORS have DECIDED TO INCREASE the CAPITAL of the Company by the ISSUE of 25,000 £1 Shares at 30s., the whole of which issue has been guaranteed at this price.

The Shareholders will have seen from the various monthly reports issued that large sums have been expended on new machinery, improvements of the battery (all the stamps of which are now 950 lbs. weight), electric lighting, new rock-drilling plant, new shafts, mine development, and especially on cyanide works, by which the gold-producing power of the property has been largely augmented.

A considerable portion of this expenditure has been paid for out of profits; but, in order to place the Company on a thoroughly sound financial basis, so that the profits made can be appropriated for dividends, the Directors have decided to issue this new capital.

Shareholders have the right of applying for Shares in the proportion of one in eight, at the price of £1 10s. per Share, according to their holding on the books on June 9.

Shareholders are also entitled to apply, in addition, such application to be allotted according to scale, subsequently to be decided upon by the directors.

Cheques at the rate of £1 10s. per share, payable to the Glencairn Main Reef Gold Mining Company (Limited), and crossed Union Bank of London, must accompany each application, which must reach me on or before June 9. Applications for fractions cannot be received.

The TRANSFER BOOKS of the Company WILL BE CLOSED from JUNE 10 to JUNE 20, inclusive.

By order,

T. HONEY, Secretary to London Agents.

2, Draper's Gardens, London, E.C., May 16, 1894.

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## MINING IN MEXICO.

## MINERAL RESOURCES AND PRODUCTION.

By J. HOWARD PALMER, B.A.

IN the year 1891, the world's production of silver, as given in Rothwell's Mining Industry, was 4,465,822 kgs., of which the United States contributed 40.6 per cent., and Mexico 28.5 per cent., Bolivia and Australia being credited with 8.4 per cent. and 7 per cent. respectively. These figures are equivalent to a Mexican production of about 1,272,000 kgs., and an Australian production of about 308,000 kgs. Since 1891, however, Mexico has not increased her output, whereas the Broken Hill Mine alone is turning out 250,000 ounces per week, equivalent to an annual production of about 421,000 kgs. Apart from financial and political considerations, this great advance in Australia, as a silver producing country, has done a great deal to lower the price of silver, and render unprofitable the low-grade ores of the Western States of America. The depression, however, has not been severely felt by the Mexican mines, according to the official statistics courteously supplied to the writer by the Consulate-General of the Republic in London. The export from the Republic for the months of July, August, and September, 1893, in the shape of coin and bullion, was \$10,489,193 Mex. silver and \$211,291 gold, as compared with \$11,195,297 Mex. silver and \$250,600 gold in the corresponding months of 1892. These figures, it is true, show a decrease upon 1893, but it is more than probable that this falling off is chiefly due to decreasing production in Guanajuato and Zacatecas, where the ancient mines are becoming unprofitable owing to their great depth, and to water difficulties. There is, however, plenty of low grade ore in such mines still which will be available when the country is further opened up, and the cost of mining reduced from the high figure at which it now stands; and, further, the Durango, Sonora, and Sinaloa States have never been effectively worked owing to the refractory character of the ores and the absence of transport facilities. The low gold export by no means represents the production of the Republic, as it only accounts for those doré silver bars of which the gold contents were so small as not to pay for refining in the country. The actual output of gold is about 1000 kgs. annually, of an approximate value of \$1,400,000 Mexican. The difference is either coined into \$20 pieces, and hoarded in the country or used in the arts. In addition to the foregoing, there were exports of argentiferous lead, copper, and zinc to the value of \$2,484,000 in the three months of 1893. In 1892, on the three months average given above, the silver exported from Mexico was \$44,780,000, of which \$25,500,000 was in the shape of coined dollars, which would ultimately find their way to the East, less \$1,000,000 to provide for the home circulating medium. The Mexican Government realises a comfortable income from this coinage, as it charges a 4½ per cent. seigniorage, and there is but little doubt that the silver production of the country would be immensely stimulated if the capacity of the mints were increased, owing to the almost unlimited demand for Mexican dollars for trade purposes in China and the Far East. At present the mints are working at their full capacity, and a member of the United States Senate has lately proposed in the coolest fashion that the Mexican Government should allow the use of their dies for the coinage of Montana and Colorado silver for export to China from San Francisco. To this proposal, however, there is not much chance of Mexico acceding, without a very substantial *quid pro quo*. In conclusion, the above figures clearly show that the Mexican silver industry has not been depressed to anything like the extent that is commonly supposed. Of course, the profits of the mines have fallen, but there has been none of the wholesale shutting down of mines and general paralysis of the silver interest which has taken place in Colorado. As long as Mexico holds the monopoly of the Eastern trade dollar, her mines will continue to flourish. Other countries can produce bar silver, but the Chinese demand is for Mexican dollars rather than for the crude article.

In metals other than gold and silver the production of Mexico at present is comparatively insignificant. Copper is found in Guadalajara and Lower California, but there appear to be no statistics of any production.

Tin is known to exist, and has been worked in Durango, Zacatecas, and Guanajuato, but only upon a small scale, and by the most primitive methods. Of the Guanajuato deposits the writer can speak from personal knowledge, and it seems very probable that the tin deposits in porphyry of this district could be worked at a handsome profit upon a large basis, and with modern machinery. The lodes are wide, and in places extremely rich (up to 30 per cent.), and the gullies are full of stream tin, which is washed by the Indians in the rainy season.

Quicksilver occurs in Chihuahua and Guadalupe, and in the latter place both the Mexicans and an English company are at work, but the output, though considerable, is not adequate to satisfy the internal demand. The Guadalupe district comprises a limestone belt some 40 miles long, but the ores are poor, hardly averaging 5 per cent. of quicksilver per ton. This percentage, however, should pay well, but it must be worked on a large scale to do so.

The lead smelting industry in Mexico has lately assumed very considerable importance owing to the action of the United States in imposing a prohibitory tariff upon the importation of Mexican ores. Formerly, most of the silver lead ores were shipped to Denver, but there are now large smelters in Monterey, S. Luis, Potosí, and Michoacan, and the annual output is about 45,000 tons. Most of the Mexican lead ores are very rich in silver, and this branch of mining is not likely to suffer considerably from the low price of lead.

Iron is hardly worked at all owing to the want of fuel, and coal deposits of any importance do not exist. The fuel question is, perhaps, the most vital in Mexican mining, for in the elevated districts where the mines lie, the only timber is scrub oak, and the cost of imported coal is practically prohibitive. Though the cost of mining is necessarily high, there is ample opportunity for judicious investment of capital in the less explored districts, and good labour and transport of a kind can always be procured. The Government is friendly disposed towards foreign enterprise owing to the wise and far-seeing policy of Don Porfirio Díaz, President of the Republic; and life and property are now practically as safe in Mexico as they are in England.

RICH gold is reported to have been found in deep alluvial ground at Forest Reefs, near Orange, N.S.W., one party of prospectors obtaining 125 ounces from two weeks' washing. Sinking has been carried down about 125 feet.

AN assay of quartz sent the Mines Department at Melbourne by a prospector, who was recently dispatched to Omeo by the Minister of Mines, gave 5 ounces 3 dwts. 5 grains of gold, and 1 ounce 15 dwts. 6 grains of silver to the ton. The same prospector also discovered a second reef of quartz, the steeper, from which, on assay, gives a return of 15 ounces 13 dwts. 19 grains of gold, and 3 ounces of silver to the ton.

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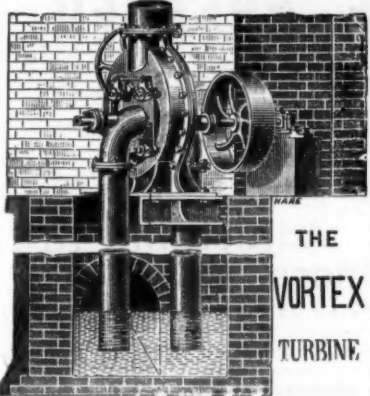
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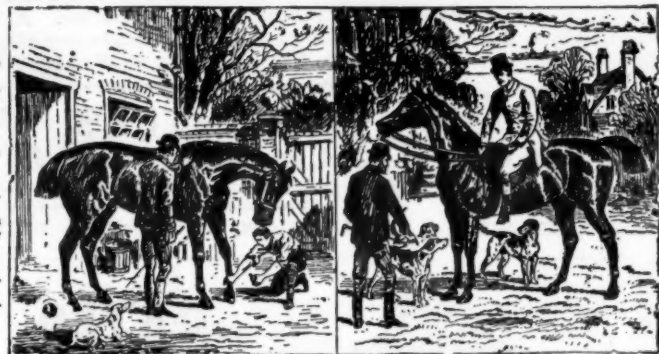
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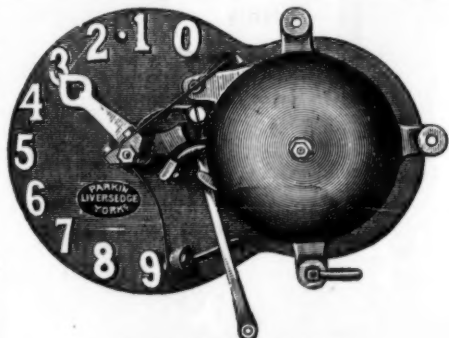
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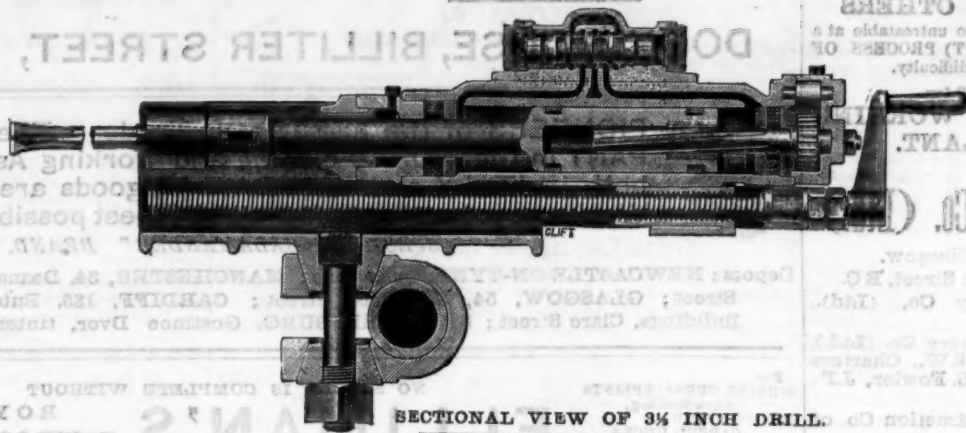


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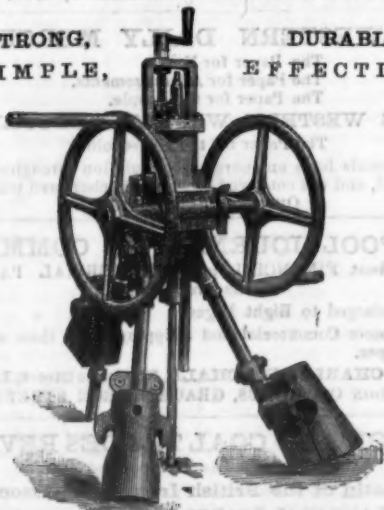
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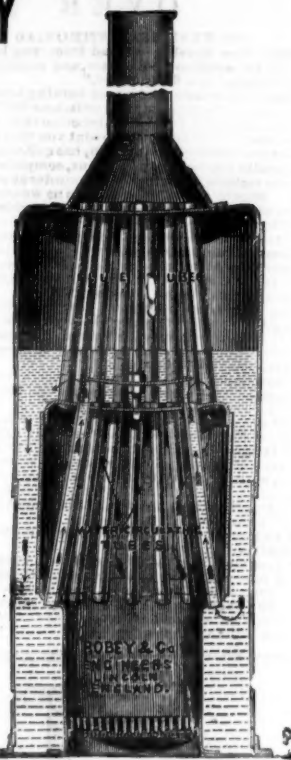
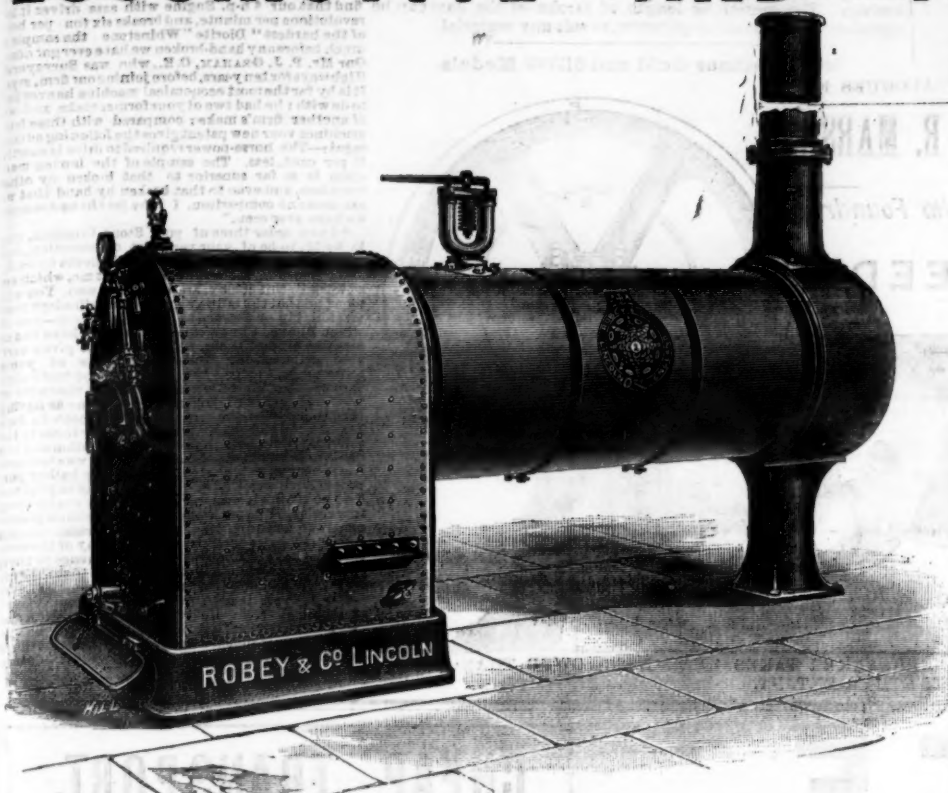
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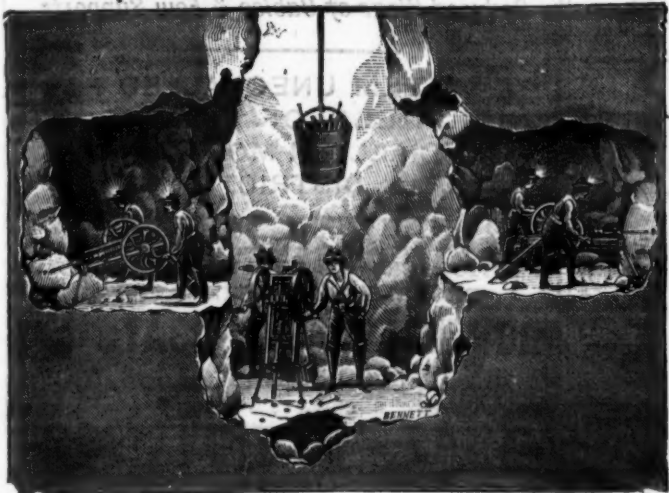


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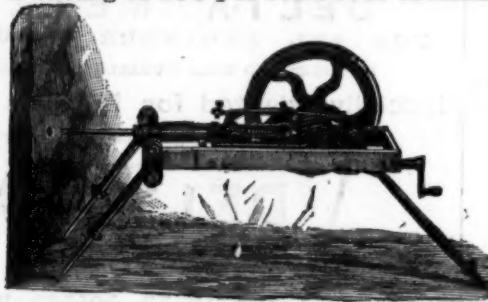
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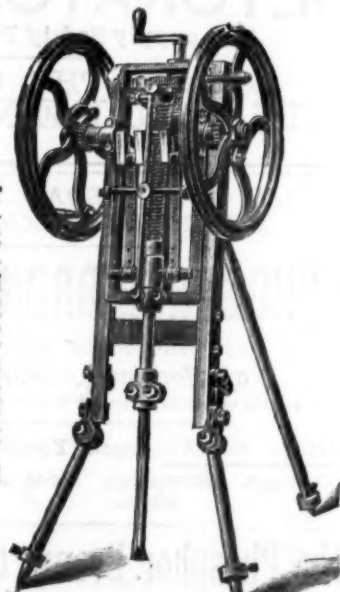
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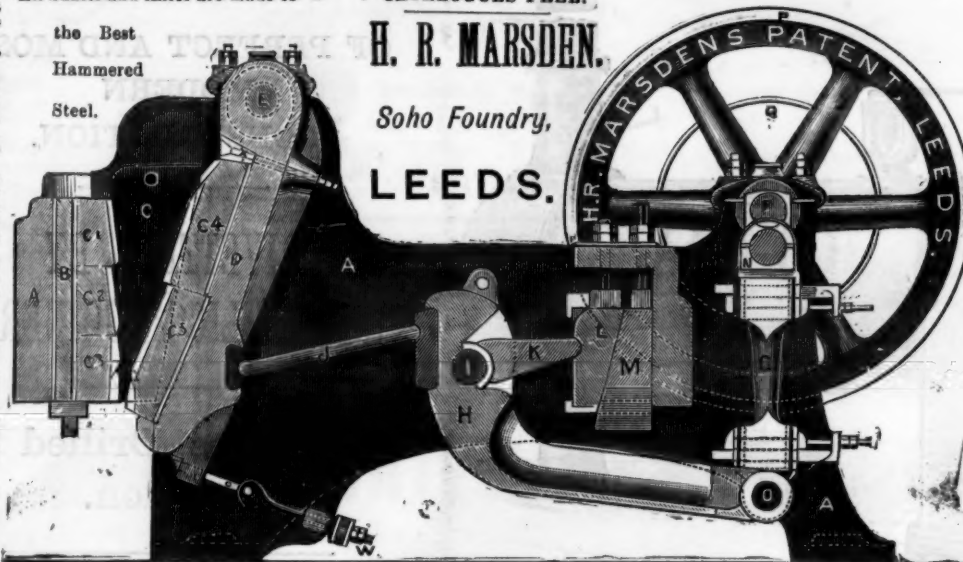
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